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GEOGRAPHICAL DISTRIBUTION AND THE COLD-RESISTING CHARACTER OF CERTAIN HERBACEOUS PERENNIAL AND WOODY PLANT GROUPS[1]

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Among horticulturists, foresters, gardeners, and others trained in the care and growing of herbaceous perennials and woody plants, it is common practice to use seed obtained from the northern limits of the geographical range of a certain species, when it is desired to grow this species in a district with similar winter temperature and other climatic conditions. This practice is based on the belief and tradition, supported by certain groups of facts, that herbaceous perennials and woody plants differ individually within the species in their ability to stand cold.

This individual difference, so far as the writer knows, has never been correlated with any gross morphological or anatomical characters, such as are commonly used in distinguishing systematic species, subspecies or varietal forms. For example, such a woody species as the black walnut (*Juglans nigra*), having a wide north and south temperature range, has not been segregated into subspecies on the basis of the differential geographical susceptibility of its individuals to temperature ranges. Black walnut trees from Minnesota, on the average, are indistinguishable from those in Alabama or Texas. Yet from the standpoint of hardiness, *i.e.*, ability to withstand the winters of the northern range limit of black walnuts, those from Texas and Alabama are

[1] Brooklyn Botanic Garden *Contributions*, No. 46.

believed to be very distinct, since the idea prevails that they would not survive the winters of the northern limit of the *Juglans nigra* range, *i.e.*, in South Dakota or Minnesota.

In some horticultural publication in long years past (I think it was by L. H. Bailey, although much searching has not located it), I recall reading of an experiment with black walnut bearing on this very point. Nuts from trees in southern Illinois were planted in northern Illinois and the seedlings from them winter-killed. Nurserymen of the northwestern states (South and North Dakota, Minnesota) commonly regard Vermont apple seed as more desirable for raising seedlings for grafting purposes than that which comes from France, because seedlings from the former are less liable to winter-kill. Yet both kinds of seed come from the same apple species.

Strains of the same species of alfalfa vary remarkably in their winter-hardiness, as was demonstrated by experiments with several hundred varieties at Edgeley, North Dakota. According to Arny (1924), strains of red clover from France, Chile, and Italy winter-killed 81 per cent., 89.5 per cent., and 93.8 per cent. respectively, when grown in Minnesota, while seed from the northern tier of states, grown under the same conditions, gave a much lower percentage of winter-killing. Mr. Russell Silvers, of Hicksville, N. Y., personally told me of a striking case of a plant of the Virginia creeper, *Parthenocissus quinquefolia*, from Cuba, indistinguishable from our common northern type, which winter-killed when grown outdoors in New York.

Many other cases similar to those above might be given as evidence favoring the belief and horticultural practice that varieties, strains, and geographical forms within a species vary considerably in their ability to resist cold. Horticulturists and gardeners are well acquainted with this body of fact.

Natural selection is commonly credited with originating these differences, but it is generally understood that each species has a limit within which it varies as regards its ability to withstand cold. Thus species and their forms and varieties are designated hardy, half-hardy, and tender, usually with reference to a given locality such as the Arnold Arboretum or to a given region as the northern great plains area of the United States, or the sub-tropical regions of Florida and California. Altitude, winter humidity, winter

wind, and the presence of large bodies of water are factors that modify climate in relation to plant hardiness or over-wintering.

De Candolle (1904), referring to the various barriers limiting the distribution of species, finds not the slightest indication that perennial species have become adapted to greater cold and thus extended their range northward to any great degree within the historical period in spite of the fact that their seeds are in one way or another continually being carried north of their present range.

> "Periods of more than four or five thousand years, or changements of form and duration, are needed apparently to produce a modification in a plant which will allow it to support a greater degree of cold."

In other words the temperature-requirement limits of species are now practically or for the most part fixed. In general this is the current belief among botanists, horticulturists, and others that have given attention to the subject.

However, since the rediscovery of Mendel's laws in 1900, and the subsequent development of the experimental study of heredity and variation, only two general methods by which inherited variations can arise are recognized. One method involves hybridization through which new combinations of hereditary units or genes take place, resulting in new characters. The other method is mutation. New genes arise only through some form of mutation and, since these form the bases of all characters, they are the material which natural selection sorts. As the ability to stand cold is an inherited characteristic its basis is dependent on the presence or absence of certain genes, though very little is known about genes of this character or of the number of genes involved. The distribution of herbaceous perennials and woody plants, then, as far as temperature is concerned, is determined by their gene make-up. On this hypothesis, the only method (after selection has ended its sorting) by which such plants could extend their northern range limits—their ability to stand lower degrees of temperature—is through mutation, which means in most cases gene mutation. Do walnuts from Minnesota differ then from those in Texas and Alabama by a gene (or a series of genes) that determines a walnut's ability to stand different winter temperatures and in no other way expresses itself, at least so far as the systematist is concerned?

From the evidence at hand it would seem so. And if it has occurred in such species as *Juglans nigra* and a host of others with a wide temperature-toleration range, why is not the same process operating at present? The writer believes it is.

From the vast quantity of data derived from genetic experiments during the last twenty-five years on hundreds of species of animals and plants, and in particular on the vinegar fly, *Drosophila melanogaster*, Muller (1923) and other investigators have concluded that mutations take place in all directions. By this I mean all types of new characters arise—not just characters of certain kinds, or necessarily in a series in a certain direction, as on the orthogenetic concept. Mutations affect shape, size, color, scent of flowers; height, number of leaves, phyllotaxy, number of flower parts, stem color and shape, resistance to various diseases; color, shape, size, flavor, etc., of fruit; shape of wings and number of legs in animals, as well as length, texture and color of hair. In fact, characters of every description disappear or become modified in various degrees or become changed beyond recognition through mutation. So far as can now be seen from this immense amount of data, the innumerable structures and functions of all organisms are affected by mutation. In the vinegar fly, *Drosophila melanogaster*, Plough and Strauss (1923) found a wild strain which differed in its temperature-tolerations from all the other wild strains of this species that have been investigated experimentally. The ordinary strains will breed indefinitely on banana agar at 31° C., but this strain will not tolerate a temperature above 29° C. Two other species of *Drosophila* have this same temperature limitation, and hence are not found in the tropics.

If the assumption is granted that inherited variations in ability to survive various degrees of cold result only from mutation, and that mutations have occurred in the past and do occur now without reference to necessity or purpose, it seems reasonable to assume as a practical working hypothesis that most species *may* give rise to cold-resisting types. But if the cold-resisting mutant individual arises in a species confined to the tropics, to take an extreme case, where competition is strong, no advantage would accrue to it or to its progeny in the struggle for existence, so there is no reason to suppose that it would produce large

colonies. In fact, there is serious reason to believe that such a mutant group would be handicapped. Morgan and his co-workers and many other investigators of inheritance and mutation phenomena have repeatedly called attention to the strange fact that mutations for the most part are weak or less fitted to cope with their environment as compared with the more vigorous common wild types. The centuries involved in perfecting such organic machines, through the workings of natural selection and mutation, have brought about such a degree of adaptation between the organism and its surroundings that any change, though seemingly slight, may handicap it, particularly in competition with its "normal" or wild kindred.

But even supposing no such handicap were involved, and the species in which a mutant occurred with ability to tolerate greater degrees of cold were resident in the tropics, how would this mutant's existence be recognized? So far as the writer can see, under present day practices in horticulture, landscape gardening, and forestry, the chance of discovering it would be extremely remote. Traditionary practice and belief, the propagation of the great majority of economic and ornamental herbaceous perennials and woody plants by asexual methods (cuttings, crown divisions, budding, grafting, bulbs, tubers, etc.), all form obstacles against which such a mutant could make itself known only by the merest chance. And when collections of seed are gathered in such regions for transmission to more temperate climates, the collections are from comparatively few individual plants. Hence there would be small likelihood of discovering such mutations accidentally.

For some years, the writer has been collecting information on the variation, among the individuals of a species, in ability to resist various degrees of cold. The problem as it presents itself can best be put in the form of a question. *Is it not probable that many tropical, sub-tropical, and temperate species give rise, through mutation, to individuals or to small groups of individuals much more cold-resisting than the individuals of the species as a whole, and that these "hardy" mutants remain for the most part unrecognized because they occur and grow under conditions where the character in question could not be expressed?*

According to current geological beliefs, the climate of the earth

was once much warmer than at present. In those distant ages, various woody representatives of a number of present-day tropical, sub-tropical or warm temperate families grew much farther north than now. Many examples might be given, but space for the time being allows citing only a few of the most striking cases. Representatives of the present-day sub-tropical or tropical cycad group then grew in the Black Hills of South Dakota, in such large quantities that their fossil remains have led to considering certain areas in this region as desirable possibilities for a national preserve or "cycad cemetery." Other fossil representatives of this group have been found in Alaska. Fossil species of the genus *Juglans*, according to Knowlton (1919), occur in Alaska, indicating a range in ancient times far beyond the present geographical range of the genus. Fossil representatives of the genus *Magnolia* are known from Montana and Alaska. *Sequoia*, *Ficus*, and *Persea* are known in fossil remains representing practically every general region of the United States. Such present-day tropical genera as *Mimusops* (the balata genus), *Dalbergia* (the rosewood genus), and *Artocarpus* (the bread-fruit genus), judged by the fossil records, once grew in regions where they are now grown only as greenhouse plants. *Mimusops* is known from Tennessee, *Dalbergia* from Staten Island, and *Artocarpus* from fossil remains collected in Oregon, Colorado, and possibly Yellowstone National Park.

When the climate changed and became colder, the families represented by such genera as cited above were forced to limit themselves to regions that still maintained the temperature to which they had become adapted. Many families of those days, however, must have been able to readjust themselves to the temperature changes in a comparatively short time, or perhaps in some cases they were already able to successfully meet these colder temperatures. Obviously this characteristic would not be demonstrated until the climate changed, any more than susceptibility to a given disease would show itself until the disease germs were present. From such groups came our temperate and polar floras. Whole plant families appear to have this temperate-climate characteristic, *e.g.*, *Rosaceae*, *Liliaceae*, *Fagaceae*, *Betulaceae*, *Salicaceae*. Others appear to be practically tropical, *e.g.*, *Amaryllidaceae*, *Bombacaceae*, *Bromeliaceae*, *Scitaminaceae*, *Artocarpaceae*, *Palmaceae*, *Dioscoraceae*.

There is, however, no such sweeping sharp demarcation between families in reference to their temperature tolerations as might be expected from a general acquaintance with their commonly known herbaceous perennial and woody plant members. Some families predominantly tropical have many temperate * representatives. Such is the case with the *Araceae*, *Orchidaceae*, *Papilionaceae*, *Euphorbiaceae*, *Solanaceae*, and *Oxalidaceae*. Other tropical families having few temperate herbaceous perennial woody representatives are *Bignoniaceae*, *Meliaceae*, *Sapotaceae*, *Passifloraceae*, *Anonaceae*, *Rubiaceae*, *Verbenaceae*, *Symplocaceae*, and *Aristolochiaceae*.

No attempt is made in the present publication to do more than cite examples, as I expect to treat this whole subject in great detail in a later paper.

Evidence based on plant families however is not as convincing as that drawn from the distribution of species within a genus, or from the geographical distribution of certain single species, since many botanists are inclined to be skeptical of families as natural groups, from a genealogical standpoint. There is less skepticism as to the genealogical relationships of species within a genus and individuals within a species.

The genera predominantly tropical or sub-tropical with herbaceous perennials or woody representatives at the Arnold Arboretum, and listed as hardy there by Sargent † (1922), are *Leitneria*, *Aristolochia*, *Desmodium*, *Indigofera*, *Sophora*, *Erodia*, *Picrasma*, *Cedrela*, *Andrachne*, *Sapindus*, *Meliosma*, *Zizyphus*, *Grewia*, *Hibiscus*, *Bumelia*, *Diospyros*, *Styrax*, *Symplocos*, *Jasminum*, *Marsdenia*, *Callicarpa*, *Clerodendron*, *Vitex*, *Solanum*, *Bignonia*, and *Asimina*.

Several other genera, common in the tropics, with cool-temperate representatives that are herbaceous perennials or woody plants are *Lygodium*, *Trichomanes*, *Adiantum*, *Pteridium*, *Selaginella*, *Equisetum*, *Salix*, *Ficus*, *Sapium*, *Oxalis*, *Tillandsia*, *Puya*, *Ailanthus*, *Tessaria*, *Passiflora*, *Tripsacum*, and *Gordonia*.

The genus *Citrus* should also be included here through its recently segregated form *Poncirus trifoliata*, which is hardy in

* Temperate here means cool temperature where zero (Fahrenheit) temperature may be expected. Tropical refers to frost-free regions.

† Only some of the more striking are listed here.

New York City. This species, though strikingly distinct from the *Citrus* species, readily crosses with them, indicating a much closer relationship, from a genetic standpoint, than species in genera often do, since in many cases the species of a genus will not cross.

Striking examples of herbaceous perennial and woody species that occur in the tropics or sub-tropics (under hot-climate conditions) as well as in the cool-temperate are *Tripsacum dactyloides*, *Tillandsia usneoides*, *Pteridium aquilinum*, *Osmunda cinnamomea*, *Cystopteris fragilis*, *Parthenocissus quinquefolia*, *Leitneria floridana*, *Daphniphyllum humile*, *Asimina triloba*, *Fontanesia phillyraeoides*, *Trichomanes radicans*, *Nymphaea odorata*, *Prunus serotina*, and *Polypodium polypodioides*.

In the light of present-day geological and genetic theories and investigations the most obvious interpretation of the facts cited above is as follows:

1. Certain groups of plants were already so genetically constituted, when the climatic changes toward cooler temperatures took place, that most of them could live under these changed conditions as well as under the previous state. Possibly the *Salicaceae*, *Equisetaceae*, and *Ephedraceae* belong to these groups.

2. Other groups were completely destroyed in these regions and restricted to the tropics. To such a class, the *Palmaceae* and the *Artocarpaceae* possibly belong.

3. Through mutations occurring in regions favorable both for increasing their own numbers and for aiding in their north and south distribution, the plants of the second group have been slowly emigrating into colder regions—in a sense coming back to the geographical regions in which their groups once thrived. But obviously comparatively few of the members of this group have or have had such favorable conditions for aiding in the establishment and distribution of their mutant types. Even with the utmost aid and ingenuity of man, the distribution of the most desirable and most improved varieties of cultivated plants takes many years, and often the places to which they go are unfavorable to their permanent establishment. Centuries elapsed before Zante "currants" moved far from Greece, and only recently *Citrus decumana* (*C. grandis* of Swingle) has been established away from the tropics. If a mutant able to survive

temperate winters originated in such a species as the Brazil-nut (*Bertholletia excelsa*), it would have practically no opportunity to establish itself outside its present tropical range. Under natural conditions the seeds of this tree soon lose their viability, tropical climates stretch away on each side of its range. Birds, winds, waves, and currents could not except in rare cases and for short distances act as distributors. Hence its presence would remain unknown to man. No members of this family (*Lecythidaceae*) are known in temperate regions.

On the other hand, the *Bignoniaceae* is well known to be eminently an American tropical family. "The chief glory of the American tropics," some have called it. Its seeds are equipped for both wind and water travel. A cold-resistant mutant in this family, even though it originated in the tropics, would have a much better chance of reaching a temperate climate through wind, birds, or water. It is represented in cool-temperate climates by the trumpet creeper (*Campsis radicans*) and several species of *Catalpa*. But hundreds of species occur in the South American tropics.

The custard apple family (*Anonaceae*) is another tropical family with a cool-temperate representative, the northern pawpaw (*Asimina triloba*), which is hardy in Massachusetts. It too has more mobility than the Brazil-nut.

In a few instances, man has discovered hardiness or ability to tolerate low temperatures in plants with a sub-tropical or warm-temperate distribution. Such is the case with *Leitneria floridanum*, with a northern range limit of southern Missouri, yet it is perfectly hardy in Massachusetts at the Arnold Arboretum. A specimen of *Magnolia grandiflora* grows in Brooklyn, opposite a small park. Its natural northern range limit is South Carolina through middle Georgia and Alabama. This specimen came originally from North Carolina. It has withstood over thirty winters. According to Rehder (1916), the variety *grandiflora* of *Stewartia pentagyna* is much hardier than the species, and both grow side by side in the woods of Georgia. The species is hardy at Poughkeepsie, N. Y., far north of its natural range in North Carolina and Tennessee. According to the same authority a race of *Cedrus libani* introduced from the highest altitudes in Asia Minor is perfectly hardy at the Arnold Arboretum while

the commonly propagated race of this species is rather tender, less hardy in fact than *C. Atlantica* from northern Africa.

Occasionally one hears of a plant or so of some tender perennial or woody species that has safely passed several winters far north of its "hardy" line. A few people marvel at it, and it passes from notice. It may be the beginning of a hardier race. The writer expects to publish a much more detailed paper later. He will be glad to receive information bearing on any phase of this subject. Information concerning exceptionally hardy varieties or individuals of tropical, sub-tropical or warm-temperate herbaceous perennial or woody species is especially desired with full details of their history and age.

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ANDRÉ PARMENTIER [1]

The practice of agriculture was one of the earliest and one of the most important forward steps in the advancement of the human race from barbarism to civilization, but the practice of

[1] Address in accepting, on behalf of the Brooklyn Botanic Garden, a bronze tablet commemorating the horticultural work of André Parmentier, and presented by the Parmentier-Bayer Centenary Commission on Oct. 17, 1925.

horticulture, as the word is now understood, was a comparatively late development. So in the conquest of America by the white race, agriculture was one of the first industries, but it was 236 years after the discovery of America by Columbus before the first botanic garden was established in America. This was the garden of John Bartram, in Philadelphia, dating from 1728. Portions of this garden are still preserved.

For our interest this afternoon it is of importance to note that the first attempt to establish a commercial nursery in America was on Long Island. As early as 1725 William Prince began to propagate trees and shrubs for the purpose of ornamenting his own place at Flushing, Long Island, and about ten years later (1737) established his nursery. In 1793 it was given the name, Linnaean Botanic Garden, but continued to be essentially a commercial institution. The village of Flushing has become famous for its beautiful trees, supplied in large part from the early Prince nursery. To the influence of these nurseries is doubtless due, in part at least, the fact that advertisements of homes for sale at various places on Long Island, in 1750, stated that they had flower gardens attached, and in 1756 places were advertised having "greenhouses filled with tropical plants." A pottery at Whitestone, Long Island, advertised "flower pots" for sale as early as 1751.

The increase of private gardens such, for example, as Peter Stuyvesant's "Bouwerie," in Manhattan, increased the demand for horticultural novelties, and the nursery business became increasingly attractive.

"The New York Botanic Garden in Broadway near the House of Refuge," conducted by Thomas Hogg in 1822, at the corner of Broadway and 23d St., and moved in 1840 to 79th Street and East River, was possibly the second commercial nursery in New York State; but the second one on Long Island, and the first institution in Brooklyn to be called a "Botanic Garden," was the nursery of André-Joseph Ghislain Parmentier, who came to America from Belgium in 1824.

In the interest of correct understanding, special attention is called to the fact that while Prince and Hogg and Parmentier called their institutions "Botanic Gardens" they were not such in the modern sense of the word, but were primarily and essen-

tially commercial nurseries. A botanic garden, as the term is now used, is a scientific and educational institution, with no commercial aspects whatever, and the nursery of André Parmentier is only remotely comparable to our modern botanic gardens.

The importance of these early nurseries lay in the fact that they were pioneers in the nursery business, and the ability and high ideals of their proprietors gave them an importance in the development of horticultural interest and taste that could never be conceded to many of our modern commercial nurseries.

Parmentier is a famous name in the annals of European horticulture. Antoine-Augustin Parmentier, a Frenchman, and a relative of the man we are honoring this afternoon, rendered signal service to France during the famine of 1769 by introducing the cultivation of the potato into that country. Now, the potato belongs to a family of plants (*Solanaceae*) that contains species known to be poisonous, and so it was necessary to overcome a deep-seated popular prejudice against the use of the potato as food. In order to overcome this prejudice Parmentier induced the emperor, Louis XVI, to wear a flower of the potato plant in his buttonhole, and also to eat some of the tubers. Shortly thereafter Parmentier gave a banquet in Paris which was attended by many of the nobility and other famous men, including our own Benjamin Franklin, and the renowned French chemist, Lavoisier. At this banquet no food was served except potatoes cooked in every way then known to French chefs. After this banquet the demand for potatoes increased to such an extent that people broke through the fence surrounding Parmentier's potato patch and stole his crop. From this Parmentier concluded that popular prejudice against the new food had largely disappeared. The use of the potato contributed toward alleviating the suffering brought about by the famine, and the first popular name of the potato in France was *parmentière*—the name *pomme-de-terre* being introduced later.

Louis Parmentier, a brother of André, was a famous grower of roses in France. Another and older brother, Joseph-Julien Ghislain Parmentier (1775–1852), was one of the chief promoters of horticulture in Belgium during the first quarter of the nineteenth century. While still a young man he showed a passion

for cultivating flowers and trees. He finally became the mayor of Enghien, his birthplace, and developed there a beautiful municipal park of 300 acres, containing over 2,000 species and varieties of trees and shrubs collected by him from all over the world.[1] This list became important as a source of knowledge concerning the origin of plants cultivated in Belgium.

It was in the Enghien park that André Parmentier, under the guidance of his brother, Joseph, became a skilled landscape gardener. Business reverses led him to migrate to America. The fame of the name Parmentier had preceded André to this country, and soon after his arrival he was urged by Dr. David Hosack and others to become the superintendent of the then famous Elgin Botanic Garden, established by Dr. Hosack on Murray Hill, just north of the present site of the Grand Central Terminal in Manhattan. Rejecting this offer, he purchased, on October 4, 1825, a tract of 25 acres of land in Brooklyn located at the juncture of the Jamaica and Flatbush Roads. The price paid for this property was $4,000! The area was included, roughly, between what are now Sixth and Carleton Avenues and Bergen Street and Atlantic Avenue.

This nursery soon became famous, and Mr. Parmentier's services were widely sought (from our Southern States to Canada, as well as in the vicinity of Brooklyn) as a landscape gardener in laying out gardens and parks. The black beech tree, and many varieties of shrubs, vines, and herbaceous plants were introduced into America for the first time by Parmentier. The number of varieties under cultivation and offered for sale is almost beyond belief, considering the time and the place.

In 1922, Mr. Frank Bailey, Chairman of the Governing Committee of the present Brooklyn Botanic Garden, presented our library with a copy of Parmentier's catalog. In it are listed for sale, among other items, 242 varieties of apples, 190 kinds of pears, 71 varieties of cherries, 5 of quince, 12 varieties of European grapes in addition to seven varieties of native American grapes,

[1] A list of the plants grown by Joseph Parmentier in the Enghien park was published in *Catalogue des plantes cultivées par M. Joseph Parmentier, maire de Enghien, department de Jemmape, a l'epoque du la jannier, 1808.*

See, also, *Catalogue des arbres et plantes cultivés dans les jardins de Mr. Joseph Parmentier.* Bruxelles, Demanet, 1818. 82 pp.

85 of plum, 64 of peaches, 24 of gooseberries, 20 kinds of nut trees, 235 varieties of roses, together with figs, melons, the persimmon, papaw, currants, strawberries, and many varieties of Paeony, Iris, Phlox, Carnation, and Lilies.

An account of the annual banquet of the New York Horticultural Society, published in the New York *Evening Post* of September 1, 1825, states that the dessert from Parmentier's garden "furnished a more rich and beautiful display of horticultural products than has ever before been exhibited in this city."

But in addition to stimulating horticulture and introducing new kinds of plants, Mr. Parmentier rendered another most valuable service to American horticulture.

A visitor from Scotland, inspecting the Brooklyn Botanic Garden last week, remarked continually that this did not seem to him to be an urban garden—he could hardly believe he was really in the midst of a great city, so naturalistic was the treatment. It was André Parmentier who first in America spread abroad the gospel of naturalistic treatment for parks and gardens. In his catalog, just mentioned, he says: "It has been reserved for the good taste of the present age to make many advantageous changes in the embellishment of gardens, and to reinstate Nature in the possession of those rights from which she has too long been banished by an undue regard to symmetry.

"Our ancestors gave to every part of the garden all the exactness of geometric forms; they seem to have known of no other way to plant trees, except in straight lines; a system totally destructive to beauty." But he continues, "Gardens are now treated like natural landscapes, the charms of which are generally injured by any interference of art."

This was 30 years before the inspired architects of Central Park and Prospect Park insisted in preserving there a bit of the country in the midst of the city. What a splendid contribution to horticulture, to art, and to good taste was made, in a country where it was sorely needed, by André Parmentier! Says Mr. Andrew Jackson Downing in his *Treatise on the Theory and Practice of Landscape Gardening*,[1] "We consider M. Parmentier's labors and examples as having effected, directly, far more for

[1] First published in New York in 1849.

landscape gardening in America, than those of any other individual whatever."

Professor Bayer, who initiated and accomplished the work which brought us together this afternoon, has also rendered a public service and merits our sincere gratitude. The Brooklyn Botanic Garden extends its thanks to Professor Bayer and his distinguished Committee.

The President of our Board of Trustees, Mr. Babbott, and the Chairman of the Botanic Garden Governing Committee, Mr. Bailey, who are absent from the city this afternoon, have authorized me, on behalf of the Botanic Garden authorities, to accept, Sir, with every expression of appreciation and honor, this tablet, which, in the years to follow, shall remind the people of Brooklyn of the valuable pioneer services to horticulture of André Parmentier.

DELECTUS SEMINUM, BROOKLYN 1925

List of Seeds Offered in Exchange

These seeds, collected during 1925, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. Seeds which lose their vitality rapidly by drying are being stored outside, underground (stratified). Seeds of species marked * have been collected from wild plants; those marked (c), from conservatory plants, the others from plants cultivated out of doors.

To simplify and improve our work we offer this year seeds of trees and shrubs only; next year we intend to offer seeds of herbaceous plants only.

GYMNOSPERMAE

Ginkgoaceae

Ginkgo
biloba

Pinaceae

Juniperus
communis depressa
**virginiana*
Picea
**rubra*
Pinus
nigra
Strobus
Thuja
**occidentalis*
Tsuga
**canadensis*

Taxaceae

Taxus
**canadensis*
cuspidata

DICOTYLEDONES

Aceraceae 163

Acer
Negundo
**rubrum*
**saccharum*
**spicatum*

Anacardiaceae 153

Rhus
copallina
glabra
**Toxicodendron*
**typhina*
**vernix*

Aquifoliaceae 157

Ilex
crenata
glabra
laevigata
**verticillata*
Nemopanthus
**mucronata*

Araliaceae 227

Acanthopanax
divaricatus
Aralia
spinosa

Berberidaceae 93

Berberis
- *emarginata*
- *Poiretii latifolia*
- *Thunbergii*
- *vulgaris*

Betulaceae 61

Betula
- *japonica* var. *szechuanica*
- **populifolia*

Alnus
- *glutinosa*
- **incana*
- **rugosa*

Carpinus
- *Betulus* var. *quercifolia*
- **caroliniana*

Corylus
- *americana*

Bignoniaceae 258

Catalpa
- *bignonioides*
- *ovata*
- *speciosa*

Caprifoliaceae 271

Diervilla
- **Lonicera*
- *rivularis*
- *sessilifolia*

Lonicera
- *dioica*
- *japonica* var. *Halliana*
- *Maackii*
- *Maackii* var. *podocarpa*
- *muscaviensis*
- *Korolkowi*
- *lanceolata*
- *quinquelocularis* var. *translucens*
- *Ruprechtiana*
- *syringantha*
- *Webbiana*

Sambucus
- **canadensis*
- *racemosa* var. *tenuifolia*
- *submollis*

Symphoricarpos
- *albus*
- *occidentalis*
- *occidentalis* var. *Heyeri*

Viburnum
- **acerifolium*
- **alnifolium*
- **cassinioides*
- **dentatum*
- **Lentago*
- *Opulus* var. *americanum*
- *pubescens* var. *affine*
- *rhytidophyllum*
- *theiferum*
- *tomentosum*

Celastraceae 158

Celastrus
- *flagellaris*
- *orbiculatus*
- **scandens*

Euonymus
- *Bungeana*
- *europaea*

Cercidiphyllaceae 90a

Cercidiphyllum
- *japonicum*

Clethraceae 230

Clethra
- *alnifolia*

Combretaceae 221

Terminalia
- (c) *Arjuna*

Cornaceae 229

Cornus
- *alba*
- **canadensis*
- **florida*

Ebenaceae 240

Diospyros
virginiana

Elaeagnaceae 215

Elaeagnus
angustifolia
umbellata
Shepherdia
**canadensis*

Ericaceae 233

Andromeda
glaucophylla
Arctostaphyllos
**Uva-ursi*
Erica
stricta
Gaultheria
procumbens
Kalmia
**angustifolia*
**latifolia*
Leucothoe
Catesbaei
**racemosa*
Lyonia
**ligustrina*
**mariana*
Oxydendrum
arboreum
Rhododendron
calendulaceum
maximum
occidentale
viscosum
Zenobia
pulverulenta

Ericaceae—*Vaccinioideae 233a*

Gaylussacia
**baccata*
**frondosa*
Vaccinium
macrocarpon
**pennsylvanicum*
**pennsylvanicum* var. *nigrum*
**stamineum*
**vacillans*
Vitis-Idaea

Euphorbiaceae 147

Dalechampia
(c) *Roezliana*

Fagaceae 62

Quercus
**alba*
**bicolor*
**coccinea*
**palustris*
**Prinus*
**rubra*
**stellata*
**velutina*

Flacourtiaceae 199

Idesia
polycarpa

Guttiferae 187

Hypericum
densiflorum
galioides

Hamamelidaceae 123

Hamamelis
**virginiana*
Liquidambar
styraciflua

Juglandaceae 60

Carya
**alba*
**cordiformis*
**glabra*
**ovata*
Juglans
**cinerea*
**nigra*

Labiatae 254

Rosmarinus
(c) *officinalis*

Lardizabalaceae 92

Akebia
quinata

Lauraceae 102

Benzoin
**aestivale*
Sassafras
**variifolium*

Leguminosae—*Caesalpinioideae 127b*

Gleditschia
triacanthos
Gymnocladus
dioica

Leguminosae—*Papilionatae 128*

Amorpha
fruticosa
glabra
Caragana
arborescens
microphylla
Cladrastis
lutea
Colutea
arborescens
media
Coronilla
Emerus
Cytisus
nigricans
scoparius
Robinia
Boyntonii
hispida
Pseudo-Acacia
Sophora
japonica
viciifolia
Lespedeza
macrocarpa
Wistaria
sinensis

Loganiaceae 245

Buddleia
albiflora
Davidii var. *Veitchiana*
Davidii var. *magnifica*

Magnoliaceae 95

Liriodendron
**Tulipifera*
Magnolia
Soulangeana var. *Lennei*
tripetala
virginiana

Malvaceae 175

Hibiscus
syriacus

Menispermaceae 94

Menispermum
**canadense*

Moraceae 64

Ficus
(c) *diversifolia*
Maclura
pomifera
Morus
alba
alba var. *tatarica*

Myricaceae 57

Myrica
**carolinensis*
**Gale*

Myrtaceae 222

Psidium
(c) *Cattleyanum*

Nyssaceae 226b

Nyssa
**sylvatica*

Oleaceae 243

Forsythia
viridissima
Ligustrum
Ibota var. *Regelianum*
macrocarpum
ovalifolium
vulgare

Polygonaceae 77

Polygonum
Auberti
Baldschuanicum

Ranunculaceae 91

Clematis
**virginiana*
Zanthorhiza
apiifolia

Rhamnaceae 169

Ceanothus
**americanus*
Rhamnus
cathartica

Rosaceae 126

Exochorda
racemosa
Physocarpus
opulifolius
Potentilla
fruticosa
Rhodotypos
kerrioides
Rosa
alba
pisocarpa
rugosa
setigera
**virginiana*
Wichuriana
Rubus
**odoratus*
Sorbaria
arborea var. *glabrata*
sorbifolia
Spiraea
latifolia
Margaritae
**tomentosa*
Vanhouttei

Rosaceae—*Pomoideae 126a*

Amelanchier
sanguinea
Aronia
**arbutifolia*
**arbutifolia purpurea*
Cotoneaster
Dielsiana
divaricata
foveolata
Franchetii
horizontalis
horizontalis var. *perpusilla*
montana
Chaenomeles
cathayensis
japonicus
Crataegus
barbara
beata
coccinioides
compta
delecta
effera
mollis
Oxyacantha
pinnatifida
puta
Slavinii
Eriobotrya
(c) *japonica*
Malus
atrosanguinea
costata
floribunda
ioensis
Scheideckeri

theifera
Zumi
Photinia
villosa
Pyrus
betulaefolia
Rhapiolepis
(c) *umbellata*
Sorbus
americana

Rosaceae—*Prunoideae 126b*

Prunus
communis "Ridenhauer"
glandulosa
hybrida
**serotina*
**virginiana*

Rubiaceae 270

Cephalanthus
**occidentalis*
Mitchella
**repens*

Rutaceae 137

Citrus
(c) *grandis* (*decumana*)
(c) *Limonia*
Evodia
Daniellii
Phellodendron
sachalinense

Sapindaceae 165

Koelreuteria
paniculata

Saxifragaceae 117

Hydrangea
arborescens
Itea
virginica
Philadelphus
coronarius grandiflorus
inodorus
Lemoinei
Lewisii
Satsumi
pubescens
Ribes
aureum
fasciculatum
Grossularia Uva-crispa
**lacustre*
odoratum
petraeum
vulgare var. *macrocarpum*

Simarubaceae 138

Ailanthus
glandulosa

Solanaceae 256

Lycium
chinense
halimifolium

Sterculiaceae 178

Abroma
(c) *mollis*

Styracaceae 242

Halesia
carolina
Styrax
japonica

Symplocaceae 241

Symplocos
paniculata

Tiliaceae 174

Tilia
**americana*
cordata
Oliveri

Ulmaceae 63

Celtis
**occidentalis*

Verbenaceae 253

Callicarpa
japonica
Clerodendron
trichotomum
Vitex
Agnus-castus
Negundo var. *incisa*

Vitaceae 170

Ampelopsis
heterophylla
Parthenocissus
quinquefolia
Vitis
**aestivalis*
**cordifolia*
**Labrusca*

MONOCOTYLEDONES

Liliaceae 338

Smilax
**glauca*
**rotundifolia*

Applications for seeds should be received before February 15, 1926. If this list is not returned, please indicate family numbers on your list of desiderata.

Address requests to

Seed Exchange,
Brooklyn Botanic Garden,
1000 Washington Ave.,
Brooklyn, N. Y., U. S. A.

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

The Botanic Garden is open free to the public daily from 8 a.m. until dark; on Sundays and Holidays open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue opposite Montgomery Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, and Tompkins Avenue trolleys to Washington Avenue; St John's Place trolley to Sterling Place and Washington Avenue; Union Street and Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

MEMOIRS. Established, July, 1918. Published irregularly.

Volume I, *Dedication Papers:* comprising scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. Price $1.00, plus postage.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

36. Influence of environmental factors on the infection of sorghums and oats by smuts I. Experiments with covered and loose kernel smuts of sorghum. 17 pages, 7 figures. 1924.

37. Influence of environal factors on the infection of sorghums and oats by smuts. Experimen.s with covered smut of oats and general considerations. 21 pages, 3 plates. 1924

38. Physiologic races of oat smuts. 10 pages, 3 plates. 1924.

39. Relative susceptibility of selections from a Fulghum-Swedish select cross to the smuts of oats. 17 pages, 4 plates. 1925.

40. Physiological specialization of Ustilago hordei. 21 pages, 1 figure. 1924.

41. Factors influencing the infection of wheat by Tilletia Tritici and Tilletia laevis. 24 pages, 4 plates. 1924.

42. Variation among the sporelings of a fertile sport of the Boston fern. 27 pages, 15 figures. 1924.

43. Inheritance studies in Pisum. V. The inheritance of scimitar pod. 14 pages, 10 figures. 1925.

44. Modes of infection of sorghums by loose kernel smut. 17 pages, 3 plates. 1925.

45. The inheritance of resistance of oat hybrids to loose smut. 19 pages. 1925.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication.

SEED LIST. Established, December, 1914. Since 1925 issued each year in the January number of the RECORD.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $6.00 a year.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year.

GENETICS. Established, January, 1916. Bi-monthly. Subscription, $6.00 a year.

APR 14 1926

BROOKLYN BOTANIC GARDEN RECORD

VOL. XV APRIL, 1926 NO. 2

FIFTEENTH ANNUAL REPORT

OF THE

BROOKLYN BOTANIC GARDEN

1925

"Scientia non habet inimicum nisi ignorantem."

"This is the foundation and essence of the progress of the human mind, the inevitable law for man, to go on, and to continue to widen his investigations for thousands of years, or even for millions, for there is no limit to it."

—*THOMAS CARLYLE.*

PUBLISHED QUARTERLY

AT LANCASTER, PA.

BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

BROOKLYN, N. Y.

Entered as second-class matter in the postoffice at Lancaster, Pa., under act of August 24, 1912.

BROOKLYN BOTANIC GARDEN

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* The names are arranged alphabetically.
† Resigned, December 31, 1925.

FIFTEENTH ANNUAL REPORT

OF THE

BROOKLYN BOTANIC GARDEN

1925

FOR THE ADVANCEMENT AND DIFFUSION
OF A KNOWLEDGE AND LOVE OF PLANTS

BROOKLYN, N. Y.
APRIL, 1926

LANCASTER PRESS, INC.
LANCASTER, PA.

SUMMARY FOR 1925

1. Total attendance for the year, over 504,000.
2. Total attendance, visiting classes from schools, over 58,000.
3. Total attendance at Botanic Garden classes, nearly 30,000.
4. Total attendance at lectures to children and adults, over 45,000.
5. Registration in classes, 4,054.
6. Study material supplied to over 2,200 teachers and used in the instruction of over 162,000 pupils.
7. Over 19,000 potted plants placed in classrooms of 112 schools.
8. Over 529,000 packets of vegetable and flower seeds supplied to children for planting in school and home gardens.
9. Over 3,200 packets of seeds sent to 110 foreign botanic gardens in exchange.
10. Campaign for Conservation of Native Wild Flowers continued in coöperation with other agencies.
11. Current issues of 744 periodicals on botany and related subjects received in the library, which is open free to the public daily.
12. Research continued in plant pathology, forest pathology, genetics, plant breeding, ecology, plant geography, and systematic botany.
13. Over 1,800 pages of research (by members of staff and others) have been published.
14. The Botanic Garden has been in active coöperation with over 850 other institutions and organizations during the year.
15. Additional endowment urgently needed (see next two pages, and pages 24–26 *infra*).
16. Privileges and Classes of Membership are explained on pages iv and v.

SCIENTIFIC RESEARCH
AN UNLIMITED FIELD

"The fear that work in science may be duplicated, when a new agency enters the field, is an unconscious expression of the feeling that there exists in nature a definite sum of knowledge to be uncovered and that when one fact is subtracted there remains that much less to investigate. But there is no such limit. The uncovering of one fact or phenomenon only discloses another. There are no remainders. The field is limitless. If ten times the present researches in plant breeding, diseases, and other lines were now to be instituted, we should still be touching only the borders of the unknown. Plant breeding is not one subject, but a congeries of a thousand and one problems. No two persons are likely to attack the same identical problem or in the same way. This may be said of any other field to which we happen to have given a name. We need many minds under different environments trained on all the problems of science. There need be no fear of duplication in research in any field. We shall never have enough of it."

L. H. BAILEY, President,
American Association for the Advancement of Science.

SUMMARY OF ITEMS FOR WHICH ADDITIONAL ENDOWMENT IS NOW NEEDED

FOR ANNUAL EXPENDITURES (Income from Endowment):

Personal Service

1. Salary increases	$ 20,000	
2. New positions and Retiring Allowances	20,000	
3. Special Research Projects	50,000	
		$ 90,000

Other than Personal Service

4. Library (Books and Binding)	$ 2,000	
5. Herbarium	1,000	
6. Publishing and Printing	3,000	
7. Laboratory apparatus and equipment	2,000	
8. Botanical Exploration; Field Work	2,000	
		10,000
Total Annual Income Needed		$100,000

FOR PERMANENT IMPROVEMENTS:

9. Nursery, Experimental plot, and Greenhouses	$500,000	
10. Rose garden	10,000	
Total Permanent Improvements		$510,000

Note

For a summary of the Botanic Garden's accomplishments for the year 1925 see second page preceding.

INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1.	Annual member	$ 10
2.	Sustaining member	25
3.	Life member	500
4.	Permanent member	2,500
5.	Donor	10,000
6.	Patron	25,000
7.	Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through coöperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, 6173 Prospect.

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party, when visiting the Garden.
4. Admission of member and his or her immediate family to all lectures, classes, field trips, and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Special lectures and classes for the children of members.
6. Copies of Garden publications, as follows:

    a. Record
    b. Guides
    c. Leaflets
    d. Contributions
    e. Frequent Announcement Cards concerning plants in flower and other exhibits

7. Privileges of the Library and Herbarium.
8. Expert advice on the choice and care of plants, indoors and out, on planting the home grounds, the care of lawns, and the treatment of plants affected by insect and fungous pests.
9. Identification of botanical specimens.
10. Participation in the periodical distribution of duplicate plant material and seeds, in accordance with special announcements sent to members from time to time.

THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about $300,000) was met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms, of the annual appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden to purchase all books for the library, all specimens for the herbarium, all lantern slides, and numerous other items, and to pay certain salaries, with private funds.

The urgent needs of the Garden for private funds for all purposes are more than twice as great as the present income from endowment, membership dues, and special contributions. The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.*

* A written *Agreement*, dated August 17, 1914, between the City of New York and the Institute, touching the Botanic Garden, published in full in the *Brooklyn Botanic Garden Record*, for April, 1915, amends the agreement of September 9, 1912, which amends the original agreement of September 28, 1909, published in the *Record* for January, 1912.

FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which said sum is to be used for the educational and scientific work of the Brooklyn Botanic Garden.

Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum is to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum is to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as the .....fellowship.

Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, to be used (or the income from which is to be used) for the Brooklyn Botanic Garden *

.....

.....

* The following additional purposes are suggested for which endowment is needed.

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustration for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.

FIG. 1. Japanese Garden, showing the East Indian, or Rose, Lotus (*Nelumbo nucifera*) in abundant bloom in the lake, July 24. (5620.)

BROOKLYN BOTANIC GARDEN RECORD

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FIFTEENTH ANNUAL REPORT OF THE BROOKLYN BOTANIC GARDEN, 1925

REPORT OF THE DIRECTOR

TO THE GOVERNING COMMITTEE OF THE BOTANIC GARDEN:

I have the honor to present herewith the fifteenth annual report of the Brooklyn Botanic Garden, for the year 1925.

Endowment Plans

The most important event of the year was the receipt of the following letter:

"May 25, 1925.

"*Dear Mr. Gager:*

"Mr. John D. Rockefeller, Jr., for whom I am writing, has asked me to pledge on his behalf toward the endowment funds of the Brooklyn Botanic Garden the sum of $250,000 on condition that an equal sum is obtained in cash from other sources before Dec. 31, 1926, both sums to be applied toward endowment, unrestricted as to use.

"While Mr. Rockefeller asks that the money which he thus contributes be added to the endowment funds, he realizes the unwisdom of seeking to forecast the requirements of the distant future, and is fully conscious of the danger attendant upon the establishment of any endowment fund in perpetuity. It will, therefore, be entirely agreeable to him to have the whole or any portion of the principal of this gift used, at any time after the expiration of twenty-five years from date, for any of the corporate purposes of the Brooklyn Botanic Garden, provided that such use is duly authorized by a four-fifths vote of its trustees.

Yours truly,
(Signed) RAYMOND B. FOSDICK"

Mr. C. Stuart Gager,
Brooklyn Botanic Garden,
Brooklyn, New York.

This letter was the culmination of negotiations, authorized by the President of our Board of Trustees, and initiated by a letter to Mr. John D. Rockefeller, Jr., from the director of the Garden (too long to be reproduced here), setting forth the organization and work of the Garden, its plans for future development, and its financial needs. In this letter special emphasis was placed on the need of financing our scientific work on a permanent basis more nearly commensurate with its importance.

In the fall of 1924 a representative of Mr. Rockefeller made a thorough investigation of the Garden in all of these aspects, and the letter above quoted was the result. Its importance lies, not only in its financial encouragement, but also in the fact that it is the strongest kind of endorsement of the accomplishments and future program of the Garden.

Why Additional Funds Are Needed

The *Agreement* of December 28, 1909, between the City of New York and The Brooklyn Institute of Arts and Sciences, concerning the establishment and maintenance of the Botanic Garden, provides that the City shall appropriate annually "such sum or sums of money as may seem to the said party of the first part [the City] necessary for proper maintenance," including the purchase of books and other collections and equipment, the publication of scientific, educational, and administrative reports, and the payment of all salaries of scientific, educational, and administrative officers and employees.

This *Agreement* was entered into in consideration of the fact that the Botanic Garden authorities had (as required by an act of the State Legislature) provided a fund of Fifty Thousand Dollars, the income from which should be used for the purchase of plants and (by subsequent amendment of the *Agreement*) other Botanic Garden purposes.

The organization of the Garden's work began with the appointment of the Director, which took effect on July 1, 1910, and it soon became evident that there was a much greater need for the new institution than had been anticipated. The grounds were enlarged by two additional parcels of land, the collections rapidly grew, the demands for public service increased by leaps and bounds, the attendance at the grounds and at classes and lectures gradually surpassed the most sanguine anticipations.

The City appropriations increased from $14,550 for 1911 to $85,245 for 1925—an increase of nearly 600 per cent. During the same period the private funds budget increased from $5,600 in 1911 to over $60,000—an increase of over 1,000 per cent.—until, as pointed out on page 53, nearly 45 per cent. of the total annual budget for 1925 was provided from private funds.

In the meantime the world war came and went, with its legacy of high prices. The purchasing power of the dollar became about fifty cents, or less, and institutions like the Botanic Garden found themselves with effective resources of not more than one half their former face value. The normal expansion of our work was made possible only by the efficiency and devotion of an inadequately compensated staff, and by the generous response of loyal friends to our annual appeal for contributions.

There still remains a large and important program of scientific and educational work and of civic service, wholly untouched for lack of sufficient funds.

Of the total private funds budget of $61,000 adopted for 1926, it should be pointed out that for over $22,000 we are dependent on annual contributions, most of which have to be solicited. An addition of $500,000 to our permanent funds would, at 5.5 per cent. (the present average rate of interest on our endowment), provide an income of $27,500, or only about $5,000 more than the amount now secured by solicited contributions.

In other words, the income from the fund to be secured by duplicating Mr. Rockefeller's pledge will only serve to place our present work on a permanent basis, but will provide for practically no expansion, except in so far as the annual contributions are maintained.

Curators are now obliged to meet from their personal funds part of the expenses of their field work, important field work has been left undone for lack of funds, manuscripts embodying the results of research work have been ready for the printer for more than a year, but are still unpublished for the same reason. Plans have been outlined for enriching and extending our educational work in response to public demand, but cannot be realized except with additional equipment and personnel.

Since the urgent Botanic Garden needs should be kept continuously before us until they are met, it may not seem amiss to

repeat the itemized summary of these needs from the preceding annual report. The statement will be found on page iii of this report.

Is Not Botanical Research Already Amply Provided For?

The question is sometimes raised as to whether botanical research is not already amply provided for by the work of the United States Department of Agriculture and the various State Agricultural Colleges and Experiment Stations. As Professor L. H. Bailey has so effectively stated (see page two of the second fly-leaf preceding this report), the asking of such a question is an unconscious revelation of an inadequate conception of the vast expanse of the unknown. Lord Bacon's classic statement, that he had only gathered a few pebbles from the shore of the ocean of knowledge, is as true today as it was in Bacon's time of the great discrepancy between what is known and what it is possible and essential to know.

The problems of botanical science (as of all sciences) are so numerous and so vast, from the standpoint of both pure and applied science, that there is little or no danger of duplicating work or of exhausting the problems, however much the agencies of botanical research may be multiplied.

With a recorded history of the study of plants in all civilized countries extending from the time of Aristotle to the present, there are more problems and more important problems pressing for solution today than ever before.

Importance of Botanical Research

As to the importance of research, in botany or any other branch of science, the time has passed for presenting arguments. Every intelligent person understands that most of the material comforts and necessities of today, and the intellectual and spiritual enrichment of our modern life are due, in large part, to research in pure science. The scientific work of the Brooklyn Botanic Garden is foundational for all else that it does. We can make no more important contribution to modern culture, nor to the practical needs of the modern world, than to prosecute a vigorous program of botanical research.

Only a Beginning Has Been Made

In the tabular statement on frontis page three the need is set forth of an annual income of not less than $100,000, in addition to our present small income. This amount represents the income at five per cent. on $2,000,000. The program requiring this income is a conservative one. If we have erred in our plans during the past fifteen years, it has been in underestimating our opportunities and understating our needs. When we have met the conditions of Mr. Rockefeller's pledge we shall have secured just one fourth of the amount needed to enable us to realize our present plans. I have stressed the subject of research because our appeal to Mr. Rockefeller was based largely on our need of more ample provision for research.

Investigations During 1925

The Research Program of the Brooklyn Botanic Garden is one of research in *Pure Science*. By this we mean that we are primarily interested in discovering new fundamental facts and principles as well as in new applications of what is already known.

In placing the emphasis on Pure Science we are helping to meet the greatest need in science today, and are rendering the most important service to applied as well as "pure" science, and to education.

Existing agencies for botanical research, such as the U. S. Department of Agriculture, the various State Agricultural Colleges and Experiment Stations, must, from the nature of the case, devote the larger part of their energies and resources to applied science. It is their responsibility to give to those engaged in agriculture and horticulture immediately applicable information. That service is founded upon the results of research in pure science. It is, of course, a truism that we can have no applied science unless we have something to apply in the way of foundational knowledge. This foundational knowledge must continually be enriched, extended, and revised by new investigations.

FIG. 2. Border planting of ornamental grasses, September 17. On the left the species (from right to left) are: Blue Fescue (*Festuca ovina glauca*), Narrow Leaved Eulalia (*Miscanthus sinensis gracillimus*), and Awnless Eulalia (*M. saccharifer*); on the right the tall grasses are the Banded Eulalia (*M. sinensis zebrina*). A portion of the systematic exhibit of Gramineae is shown at the extreme left. (5618.)

Plant Material Suitable for Research

In the search for fundamental principles it is essential to work with material best suited to yield the information sought after. If, in pure science work, we experiment with cereal grains or with peas, for example, it is because those plants, by virtue of certain characteristics, facilitate the search after fundamental facts. Among the characteristics which make a plant suitable material for experimental study are the following:

1. They should be *Annuals*, thus yielding a larger number of generations in a given period of time than perennials such as shrubs and trees, or such as Iris, Peonies, Dahlias, Lilies, and other herbaceous perennials.

2. They should be comparatively *Small Plants*, so that a large number of individuals may be grown in a small area.

3. They should *Breed True to Seed.*

4. They should *Produce Seed in Abundance*, so as to supply a large number of individuals in each generation.

5. They should be *Easy to Cultivate.*

6. They should be plants that may be *Readily Subjected to Experimental Conditions*, without suffering in loss of vigor or otherwise.

7. They should have many *Well-Marked and Easily Distinguishable Differences.*

8. They should be *Easy to Cross*, giving a high percentage of successes.

It so happens that the Cereal Grains, the Sorghums, and the garden Pea possess the above characteristics in marked degree. Under experimental conditions it is possible to secure two generations of the cereals and of the pea in one year.

The information obtained by these studies is of a general and fundamental nature, applicable not only to all plants but in some cases to all forms of life, including man. In the search for this foundational knowledge it would be easily possible to choose plant material that would only unnecessarily confuse or baffle the investigator. Mendel's foresight in the choice of his material (the garden Pea) for his experimental study of heredity was just as much a sign of his genius in his chosen work as was his explanation of the results he obtained and their formulation into general laws.

Importance of Research in Pure Science

An outstanding illustration of how investigations in pure science may lead to results of the highest practical importance is the work of Pasteur. Starting out to investigate what some would call the "academic" question of the spontaneous generation of living things, he was led to the discovery of bacteria, and a whole new science, Bacteriology, was born, with its incalculable practical bearings in human disease, agriculture, and a whole series of other industries.

The two most fruitful ideas contributed to botanical science during the past twenty-five years are, perhaps, the principles of heredity, known collectively as *Mendelism;* and the contribution to our knowledge of organic evolution known as *Mutation*.

The principles of Mendelism were formulated by Mendel on the basis of his studies of the garden Pea. He was not interested in peas as peas at all, but peas possessed certain characteristics that fitted them preeminently for studies in heredity; hence, Mendel studied peas, and the study of Heredity was, for the first time, placed upon a scientific, experimental basis.

The mutation hypothesis was formulated by the Dutch botanist, de Vries, on the basis of a study of the common weed, Lamarck's Evening-Primrose. De Vries was not primarily interested in the Evening-Primroses, but the most direct approach to the principle he was after seemed to be by a study of those plants; hence, they became the subject of his researches, and the experimental study of organic evolution received a great impetus, with important practical as well as theoretical results.

So, in the investigations at the Botanic Garden in the experimental phases of botany (in addition to our non-experimental studies of the local flora and the problems of plant classification), the problems are *Disease Resistance in Plants* and the *Principles of Heredity and Variation*, which underlie plant (and animal) breeding. Experience has shown us that the principles of disease resistance and control, and of heredity and variation, discovered by studying any suitable material, have a wide application throughout the plant kingdom.

The above paragraphs are written as a direct reply to a query which has been raised locally as to what are the essential needs of botanical research today and, in particular, what lines of research an urban botanic garden may most appropriately develop.

Reports by members of staff on investigations during the year will be found on pages 55–66. Six papers have been published and reissued as Brooklyn Botanic Garden *Contributions* (see p. 118).

The manuscript on the vegetation of Mt. Desert Island (Maine) in its relation to that of Long Island, mentioned in my preceding annual report, still remains unpublished for lack of funds.

Beardless Iris Project

In the Brooklyn Botanic Garden RECORD, for July 1925, a brief account was given of the plans for the test garden for beardless irises, established at the Brooklyn Botanic Garden in cooperation with the American Iris Society. A definite project was outlined with a view to solving some of the problems connected with this group of plants. The main studies are concerned with the Japanese varieties commonly referred to as *Iris kaempferi*. The following outline was prepared by Dr. George M. Reed, curator, who has immediate charge of this project.

1. *Identification of Varieties and Nomenclature.*—At present it is extremely difficult to correctly identify a Japanese iris. The same name has been applied to two or more different plants, and also the same variety has been listed under different names. A number of importations of these irises originally came from Japan and in addition irises from seed have been grown. In order to properly identify the varieties and apply to them the correct name, it is essential that all named plants be obtained and grown side by side.

2. *Description and Illustrations of Varieties.*—When we have a complete collection of varieties it will be possible to prepare accurate descriptions of them. It is also highly desirable that accurate colored drawings of the distinct varieties be prepared and made available. Only a few illustrations can be made in any one year since they have to be prepared from living plants and the blooming period is comparatively short.

3. *Classification.*—With the proper identification and description of varieties it may be possible to prepare a convenient classification based on color and other distinctive features. It may also be feasible to pass upon the merits of the different

varieties and rank them in a similar fashion to the present ranking of the bearded irises.

4. *Seedlings.*—Growing Japanese irises from seed is quite common and some of the resulting plants possess qualities of unusual merit. One can obtain from a collection of seed a very wide range in variation in the individual plants from the standpoint of color, size of flower and other characteristics. Plants raised from seedlings which are really superior should be compared with accepted standard varieties.

5. *Culture.*—There are a number of difficulties encountered in the growing of Japanese iris and the general report is that it is difficult to keep and propagate a collection. Dealers are constantly announcing a shortage of their material. Plans have been made to find out some things about culture, including such problems as transplanting, soil conditions, fertilizing, disease and its control.

While the main emphasis will be placed upon the study of varieties of Japanese iris, the plans for the trial garden include similar studies of the other groups of beardless or Apogons, particularly the Siberian and Spurian groups.

During the past year considerable progress has been made along several lines.

Previous to the fall of 1924 a collection of about eighty varieties of Japanese irises had been assembled through the cooperation of the American Iris Society and the Brooklyn Botanic Garden. During the past year very extensive additions have been made to our collection. Some of the plants were received in the fall of 1924 but most of them were obtained in 1925. The sources were as follows:

J. K. Alexander	E. Bridgewater, Mass.	15 varieties
Bobbink & Atkins	Rutherford, N. J.	64 "
John Lewis Childs, Inc.	Flowerfield, L. I.	82 "
The Elm City Nursery Co.	New Haven, Conn.	10 "
Lovett's Nursery	Little Silver, N. J.	29 "
Moons' Nurseries	Morrisville, Pa.	15 "
Sunnybrook Iris Garden	Eatontown, N. J.	19 "
Wallace & Company	England	13 "
Weed's Landscape Nursery	Beaverton, Ore.	53 "

The collection from John Lewis Childs, Inc., includes practically all of the varieties originated as seedlings by that firm and

many of the earlier introductions of Hallock were also included. The collection of Bobbink & Atkins was, for the most part, originally derived from Childs. Several of the nurseries sent two plants of each variety while the others furnished only one. A collection of thirteen varieties from J. Waterer, Sons & Crisp, Ltd., England, failed to survive importation. Barr & Sons, England, reported a shortage of stock and so were unable to furnish a collection in the spring of 1925. Arrangements, however, have been made for securing a number of their varieties. These collections make very valuable additions to the Test Garden.

Extensive additions to the other Apogons, mainly the Siberian and Spurian groups, were also made. Seed of a large number of different species was obtained from various Botanic Gardens in different parts of the world, as well as from Perry in England and Purdy in California. Seedlings are now being grown and may be expected to bloom in 1926 or 1927. Plants of various Apogons, mainly Siberian and Spurian varieties, were secured as follows:

Perry's Hardy Plant Farm	England	21	varieties
Rainbow Gardens	Farmington, Minn.	15	"
Sunnybrook Iris Garden	Eatontown, N. J.	12	"
C. G. Van Tubergen, Jr.	Holland	2	"
Wallace & Company	"	12	"

In addition to these, plants of certain species were furnished by Mr. R. S. Sturtevant, Mr. John C. Wister, and the New York Botanical Garden. Mrs. C. S. McKinney, Madison, N. J., sent a plant of "Emperor" and also five seedlings from her own crosses. Mrs. L. M. Hitchcock, New Rochelle, N. Y., sent nine seedlings from her garden. Dr. Nancy Jenison, New York City, furnished sixteen plants from her collection.

Numerous colored illustrations of different varieties were made during the blooming period. We were fortunate to obtain the services of Miss Maud H. Purdy for making these. She was able to spend most of the time during the period that the plants were in bloom and made very excellent illustrations. These have been shown to several people who are competent to judge and they have all expressed a high appreciation for their accuracy in form and coloring, as well as artistic appearance.

During the blooming period as much time as possible was devoted to a description of varieties. A full description of a considerable number was prepared, the color determinations being based on Ridgway's Color Chart. As a result of these studies we were able to become fairly familiar with the characteristics of a large number of varieties.

It was possible to visit a number of nurseries during the time when the Japanese irises were in bloom. These visits were extremely profitable because of the opportunities furnished to see large collections of these plants and become familiar with the conditions under which they are grown.

Mr. Montague Free, horticulturist, planned a set of experiments designed to give information regarding transplanting, soil conditions, fertilizing, etc. A series of eight beds was prepared and three varieties, namely, Goldbound, Dominator, and Pyramid, were planted in each. Interesting results for the first year have been obtained, but naturally such experiments cannot be expected to yield final results except after several years' study.

The old collection of Japanese varieties at the Garden was lifted, sub-divided, and transplanted during the past season. This involved the making of several additional beds and made possible some rearrangement in the grouping of the varieties. A few plants in the collection have died and some attention has been devoted to the study of a disease, which is primarily characterized by the decay of the roots and, consequently, through the lack of water, the leaves wither and turn brownish. The rhizome, however, remains essentially normal and tends to push out new roots and apparently individual plants may recover. The disease has been observed in some of the nurseries and it may turn out to be a factor of considerable importance in the disappearance of plantings of these irises.

It is a pleasure here to make public acknowledgment of the generous contributions of funds and of plants for the Beardless Iris Project. A list of the contributors may be found on page 101.

Public Service

The Garden as a Park.—Perhaps the largest (not necessarily the most important) service which a Botanic Garden renders its

local community is the maintenance of its grounds, open free every day in the year. For some, the grounds serve chiefly as a park, and the Garden is becoming increasingly a favorite rendezvous for many who find here an escape from the noise, and motion, and odor, and danger of automobiles—which have, more than any other one feature, served to detract from the charm of city parks. Motor cars are not admitted to the Botanic Garden.

Appreciation of Labels.—But people do not visit our grounds merely for its features as a park. Our labelled collections are more and more serving the educational purpose for which they were intended. One can now hardly ever walk through the grounds without seeing visitors reading labels, and frequently copying them. Inquiries by mail, by telephone, and in person, based upon the reading of these labels, are becoming increasingly frequent. This applies to the Conservatory Collections as well as to the Plantations.

Aesthetic Values.—"The most beautiful spot in Greater New York." Thus one of the metropolitan dailies referred to the Garden during the past year. To live up to this reputation is (and always has been) a prime motive in the development of the grounds. The plantations are frequented by artists painting both flowers and views; amateur photographers become more frequent each year; classes in architecture come to study our building.

In connection with each group of plant families an endeavor is made not only to exhibit plants as botanical specimens, but also to show how any of the plants in a given group may be used in decorative planting. This has added much to the beauty of the plantations as well as to the effectiveness of the exhibits.

Our naturalizing of thousands of bulbs in the lawns was the first public demonstration of this kind of planting on a large scale in Greater New York—and one of the first in a public park in the Eastern United States.

Our special features, such as the Rock Garden, Iris Garden, Japanese Garden, and Water Gardens, increase yearly in effectiveness and popularity.

Bureau of Information.—One of the objects of a botanic garden (as of any educational institution) is to create or stimulate a desire to know, but there is a special satisfaction in being able

to give information to people in whom the desire to know already exists. Requests for information on plant life are constantly being received, not only from residents of Greater New York, but from other cities and states, and from many foreign countries.

The librarian calls attention in her report (pp. 76–80) to the increasing demand upon the library for information on a wide range of topics, and in particular from business concerns. While we are delighted to render this service, it has now nearly reached the limit of the ability of our small staff to respond. The same is true of requests received for information concerning such practical problems as the care of lawns, of trees and shrubs, of house plants, of vegetable and flower gardens, of cut flowers, and numerous other such questions. We sometimes wonder how any city can get along without a botanic garden!

Public Response.—The total attendance for the year (registered at four gates, and estimated at one) was over 504,000, an increase of 66,000 over 1924. Attendance at classes and lectures was 135,000, an increase of nearly 30,000. Students were registered from every borough in Greater New York, and from several places outside of our own city.

Broadcasting.—The following talks concerning the Botanic Garden, or by members of the Garden staff, have been broadcasted during the year:

By the director:

March 31, Station WJZ. The public service of the Brooklyn Botanic Garden.

By Miss Shaw, curator of elementary instruction:

April 20, Station WNYC. Get acquainted with your garden.

April 23, WNYC. Garden steps.

May 4, WNYC. How to take care of your garden.

News Releases.—The curator of public instruction, Dr. Graves, has continued to supply weekly releases of news about the Botanic Garden to thirty-eight periodicals in different parts of the country. A fuller account of this valuable work is given in his own report (pp. 67–70).

Popular Publications.—The popularity of the Brooklyn Botanic Garden *Leaflets* continues to increase, and their circulation now extends from coast to coast (see also p. 42 and p. 118).

Attention is called to the popular, illustrated articles for children by Miss Shaw, six of which have been published during the year in the *Junior Home Magazine.*

Public Exhibits.—Special attention is called to the exhibit of our educational work sent, by request, to the spring meeting of the Michigan State Teachers' Association, held at Grand Rapids, Michigan.

Four exhibits were held locally, primarily for the general public, as follows:

September 25–27. Twelfth Annual Garden Exhibit for Brooklyn Boys and Girls. The exhibit was open on the 25th only for teachers with classes from the public schools. The attendance was over 2,000.

The annual children's garden exhibits were part of a plan to encourage children's gardening in school and home gardens throughout Brooklyn, produce from our own children's garden not being exhibited. Now that school and home gardening in Brooklyn (aided still further by our annual distribution of penny packets of seeds to children) seem to be thoroughly established, the need of the annual exhibit and distribution of prizes has largely passed, and it has been decided not to hold the exhibits after this year.

October 13. Cut flowers and vegetables raised in our Children's Garden. In connection with this exhibit, which was held in the Junior Eagle Club room, Eagle Building, an illustrated article on the Botanic Garden was published in the *Junior Eagle* for November 8, and also an editorial in the *Eagle.* The appended report of the curator of elementary instruction records other exhibits installed for Brooklyn children at the Eagle Building.

November 12. Harvest Exhibit of the various farm products of the United States, arranged according to different sections of the country. This exhibit was greatly enriched by material supplied by our departments of Plant Breeding and Plant Pathology.

December 8. Exhibit of Christmas Greens and their Substitutes. The purpose of this exhibit was to call attention to substitutes which may be used for Holly, Laurel, and Ground Pine—all wild plants which are in danger of extermination—at least so far as commercial supply is concerned—on account of the enormous quantities of them used for Christmas decorations.

An Exhibit of Christmas Greens by our Department of Elementary Instruction has been an annual event for several years. This year we have had the efficient cooperation of Mrs. Alice Earl Hyde, a member of our Woman's Auxiliary, and a small committee of ladies which she formed for this purpose.

The Exhibit was open Tuesday to teachers only, and tea was served.

Cooperation with the Schools

Teachers in the public, parochial, and other private schools brought pupils in classes for instruction during the year to the number of over 58,000—an increase of nearly 8,000 over a year ago. The total number of classes brought was 840, or 272 classes more than in 1924. The total attendance at lectures to children was over 45,000 as against 20,000 last year. Members of staff gave 78 addresses at city schools to audiences of over 20,000 teachers and pupils.

Schools are coming to depend upon the Botanic Garden more and more for the supply of living material for use in nature study, botany, and general biology classes, and for sterilized culture medium (agar), necessary in connection with the study of bacteria.

Special attention is called to the fact that during 1925 the Botanic Garden placed 19,389 potted plants in the classrooms of 112 schools, as against 8,502 plants in about 100 schools last year. These plants were supplied, not primarily for study, but to help beautify the schoolroom. Every class that visits the Botanic Garden is now given a potted plant to take back to its classroom.

Penny Packets of Seeds.—Packets of seeds for planting in school and home gardens were distributed to children through the schools for the twelfth year. The price, which has been two cents since 1917 on account of the war, was restored to one cent a packet. The number distributed was over 529,000, an increase of more than 326,000, or about 62 per cent., over 1924.

Exhibits and Teas for Teachers.—For the purpose of acquainting the teachers of public and private schools with our illustrative material and other equipment which we use in giving instruction to visiting classes, the Department of Elementary Instruction held a series of three exhibits. Special invitations were sent to

FIG. 3. Classes of 180 pupils from public schools, receiving a lesson on the shore of the lake. The pupils have printed outlines of the lesson in their hands; the instructor is using the megaphone. (5126.)

teachers of nature study. Tea was served at each exhibit by the women of the Department. The dates, subjects, and attendance of teachers were as follows:

March 24, Economic Plants, 150.
April 29, Plant Friends and Enemies, 200.
May 21, The Spring Aspect of the Outdoor World, 100.

The exhibits were kept open for several days for the general public.

Need of Automobile.—We are now delivering material to the schools so frequently and in such quantities, and so many addresses are being given at schools widely scattered throughout the Borough, that the need of a small automobile has become a necessity if the work is to be expanded as it should be, and the time and energy of those engaged in it are to be properly conserved.

Detailed accounts of our cooperation with the schools are given in the accompanying reports of the curators of public instruction and of elementary instruction.

Statistics concerning our work with schools are given in the following table:

STATISTICS OF PUBLIC EDUCATIONAL ACTIVITIES, 1925

Conferences
- Number of teachers 505
- Number of pupils involved 24,164

Loan Lectures (Lantern slides, etc.)
- Number of teachers 20
- Number of pupils attending 3,588

Study Material Supplied
- Number of schools and annexes
  - Senior High
    - In Brooklyn (Total number in Borough, 14) 12
    - Outside of Brooklyn 11
  - Junior High Schools (Total number in Borough, 15) 5
    - Colleges and Universities 5
    - Training Schools for Teachers 1
    - Elementary (Total number in Borough, 208) 42
    - Private Schools 5
    - Number of teachers 2,279
    - Number of pupils instructed 162,585

Exhibits provided
- Number of exhibits 30
- Viewed by 51,751

Living plants placed in school rooms
- Number of schools 112
- Number of plants 19,389

Agar (sterilized) for class use
- Petri dishes 1,752
- Flasks 28

Seed Packets for children
- Schools 228
- Teachers 4,394
- Pupils 204,325
- Packets 529,302

Publications and Addresses by Staff

A list of publications by members of staff during 1925 is given in Appendix 2. The total number was 53. The total number of addresses given, at the Garden or elsewhere, was 105, as listed in Appendix 3.

Conservation of Wild Plants

The Garden has continued its cooperation with other organizations in the nation-wide movement for the conservation of our native American wild plants.

Conservation Leaflet.—The Brooklyn Botanic Garden *Leaflet* of April 16, 1924 (Series XII, No. 2), entitled, "The Conservation of Beauty," was revised and enlarged, with illustrations (Series XIII, Nos. 5–6. June 10), by Dr. R. C. Benedict, resident investigator. The cost of this *Leaflet*, with an edition of 5,700 copies, was met jointly by the Botanic Garden, Torrey Botanical Club, American Fern Society, New York Association of Biology Teachers, and New York Bird and Tree Club. There was a large demand for the *Leaflet* from all over the country, and the

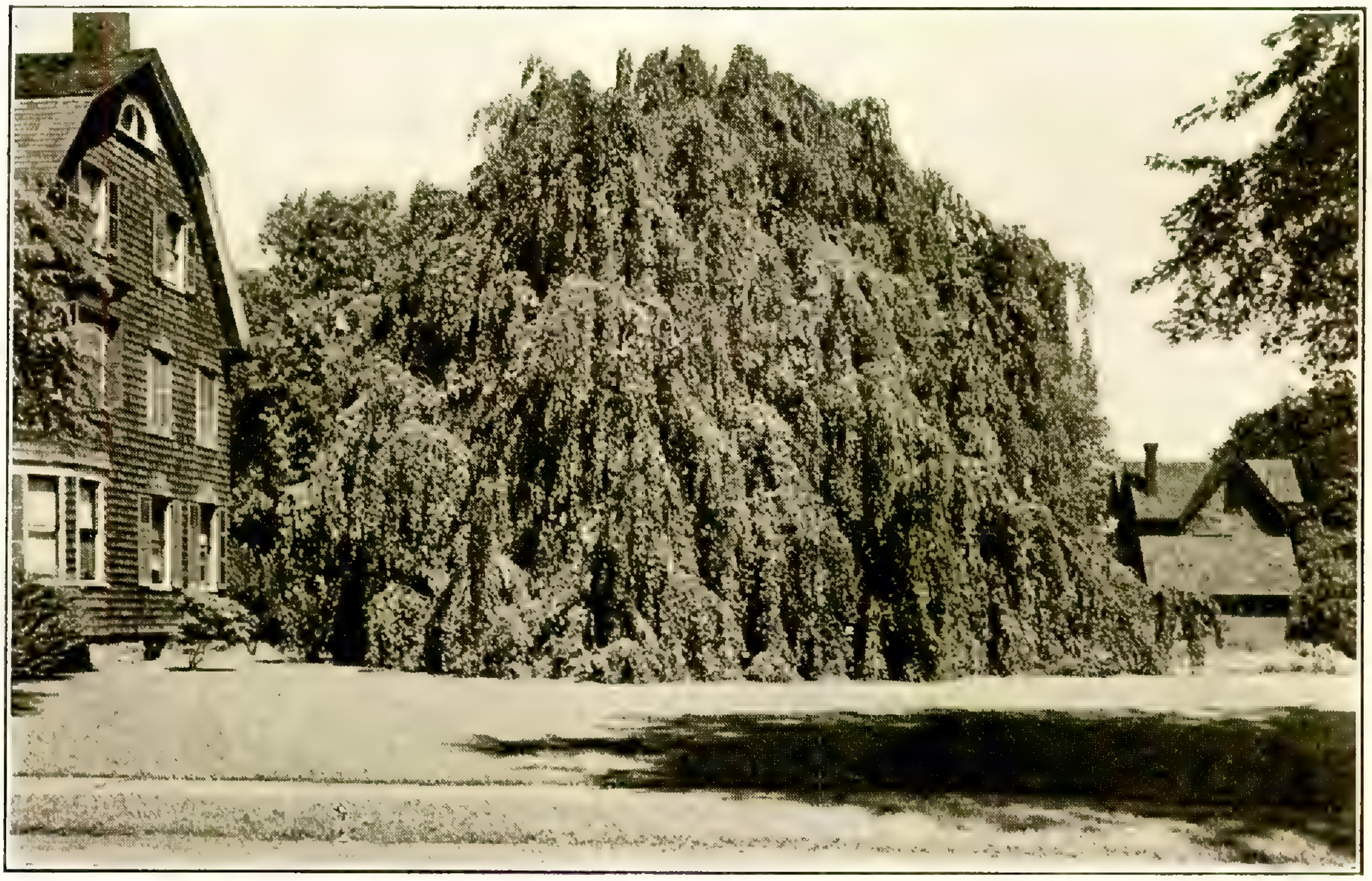

FIG. 4. The famous weeping beech (*Fagus sylvatica pendula*), of Flushing, L. I. The diameter of the crown at the ground is 75 feet. Over 300 persons can stand concealed underneath the canopy. The Botanic Garden cooperated to save this tree from destruction. (3491.) *Cf.* Fig. 5.

cut on the front page, showing an automobile party loading broken branches of Dogwood into their car, was reproduced in the monthly journal, *Horticulture* (Boston), and by the Minnesota State Horticultural Society, St. Paul.

Propagating Wild Plants.—In the *Leaflet* above mentioned several proposals were made as to what steps might be taken to promote the practice of conservation of our native wild plants.

FIG. 5. The weeping beech of Flushing, L. I. View underneath the canopy. The trunk is about 4 ft. in diameter one foot above the ground. (3492.) *Cf.* Fig. 4.

Among these steps were the providing of *Plant Sanctuaries* (just as we already have bird sanctuaries), and the *Propagation* of some of the rarer species with the idea of distributing seeds and young plants, similar to the way in which the State now distributes fish spawn to stock lakes and streams.

As a step in this direction, Dr. Benedict, the author of the *Leaflet*, began during the fall of 1925 to raise, from spores, plants of the very rare Hart's Tongue Fern (*Scolopendrium vulgare*). A note has been published in the *American Fern Journal* stating that the Brooklyn Botanic Garden expects shortly to be prepared to distribute plants of this fern to anyone who will endeavor to grow them under cultivation, or try to naturalize them in new habitats. If successful, this venture will serve, not only to increase the population of this particular species, but also to demonstrate the feasibility of this method as one of the means of conserving forms in danger of extinction.[1]

There are now growing at the Garden about 1,000 young plants ("sporelings"), and this is, perhaps, nearly, if not quite, equal to the total number of plants now growing wild in New York State.

This fern is one of our rarest wild plants, being known in the United States only in two States (Tennessee and New York), and in New York State only in two (adjacent) counties, Onondaga County (near Jamesville) and Madison County (at Chittenango Falls, near Cazenovia Lake).

Provision has been made for the growing of other native wild plants in our Native Wild Flower Section, and before long it is hoped and anticipated that we may be able to offer seeds or other propagating material of a large number of species.

The Famous Weeping Beech of Flushing.—Early in 1925 the plot of land known as the "Jackson Estate," Flushing, Borough of Queens, was offered for sale in order to close the estate, and plans had been started to erect a large apartment house on the

[1] In this connection it is of interest to recall that, as early as 1683, Robert Morison, the first professor of botany at Oxford University (England), and a contemporary of Linnaeus, germinated spores of the Hart's Tongue fern. These spores were erroneously supposed to be seeds, and therefore Morison thought the prothallia to which they give rise were seedleaves or cotyledons. This experiment with the Hart's Tongue fern was the first attempt of which we have record to raise ferns from spores.

tract. On this property stand two of the most beautiful trees in the United States, a Golden Larch and a Weeping Beech, and the erection of the apartment house would have necessitated cutting down both of these trees.

One of the trees, the famous Weeping Beech (*Fagus sylvatica pendula*), is believed to be the finest specimen in existence. The trunk is about 4 ft. in diameter one foot above the ground, and the diameter of the area covered by the branches is about 75 ft. Over 300 persons can stand underneath the canopy without crowding and without being visible from outside the tree. In earlier years this tree was used by gardeners as a "mother tree," young sapling beeches being planted close to the weeping branches which were then grafted onto the saplings.

The Botanic Garden, in May, cooperated with the Flushing United Association, in a vigorous campaign to secure the preservation, as a public park, of the property containing these trees. Proceedings to acquire title to the property (approximately 173 ft. frontage by 125 ft. deep), located on Washington Place (37th Avenue) between Bowne Street and Parsons Boulevard, Flushing, were initiated by resolution of the Board of Estimate and Apportionment on May 29, 1925, and title vested in the city by entry of the Court order, October 1, 1925. Up to the close of the year the proceeding had not come up before the Court, so that no awards had been made and the price had not been determined.

Plantations and Grounds

The New Fence.—At last the greatly needed new fence is a reality. Its need has been noted in previous reports. Several requests to the Board of Estimate and Apportionment during the past six or eight years had been declined. On March 20, 1925, the Board adopted a Resolution providing for the issuance of $40,000 of Revenue Bonds of the City of New York for the construction and erection of the fence. The contract was awarded on August 27 to the Independent Wire Works, 418 Third Ave., Brooklyn, the low bidder, in the sum of $34,440. The highest bid was $53,690. Work on the erection of the fence began on October 26, and was to be completed in 70 working days. The work was well along toward completion at the close

of the year. The erection of this fence was a prime requisite in order to enable us properly to police the grounds and to control such vandalism as all public parks and gardens are subject to everywhere.

Bulb Planting.—The planting of bulbs naturalistically in the lawns has been continued. Those planted in the fall of 1924 (about 24,000) came into bloom last spring, adding greatly to the beauty of our grounds. During the fall of 1925 there were added over 31,000 more of about 114 varieties of Narcissus, Tulip, Crocus, and other bulbs. A full report of this work is given by the Horticulturist, Mr. Free, on page 88. Of the tulips, 6,810 *I. Gesneriana spathulata major* were presented by the Del-Bay Farms, Inc., through one of our trustees, Mr. Alexander M. White. A bed of about 3,000 Lily-of-the-Valley was made possible by a gift for this purpose of $50 from Mrs. F. W. Rowe.

Tree Planting by Girl Scouts.—On Friday afternoon, April 24, the Girl Scouts of Flatbush presented and planted an American Elm tree in the grass triangle south of Azalea Knoll. The planting was accompanied by suitable exercises. This is the seventh memorial tree to be planted in the Garden.

Shortage of Labor.—The work of upkeep of our collections increases each year as the collections increase. More and more of the Garden comes annually into intensive cultivation, trees and shrubs grow larger and require more care, and replacements also increase, yet we have had no addition to our small force of gardeners for seven or eight years. For a garden of about 40 acres under cultivation, there are only four trained gardeners (one for each ten acres!), supplemented by part time assistance during part of the year of one or two laborers. There is a corresponding shortage in the laboring force. Among the results of this inadequate labor supply, it may be noted that some four or five acres of the north addition still remain to be graded, topsoiled, put into lawn, and planted, not to mention the unsatisfactory general upkeep of the grounds and the collections of living plants. The loss of trees and shrubs owing to the ravages of borers has been disheartening, and could have been greatly reduced if we had had more gardeners. An item in our annual tax budget request for more gardeners has been repeated for several years, but not granted.

Smoke Nuisance

The pollution of the atmosphere above and surrounding the Garden by soot and fumes from the burning of oil and soft coal has been greatly aggravated by the increase of apartments and factories (especially south and east of the Garden), and by the increase in the use of these fuels on account of the strike in the anthracite coal fields. Prospect Park, west of the Garden, is suffering in a similar way. Soot now settles on the roof of our conservatories to such an extent as to reduce the intensity of light inside the houses below the optimum required for plants. Vegetation is coated with a layer of soot which cloggs the stomata or pores of the foliage and young branches, thus interfering with the normal life-processes. This is specially disastrous to evergreens. It seems folly for a city to spend money for the maintenance of beautiful parks, and then permit such municipal development (factories, etc.) in the vicinity of the park as largely to undo the work of the Park Department, including the killing, by the hundreds, of trees that have taken—some of them—as long as fifty years or more to develop.

Numerous botanic gardens in large cities, in this and other countries, have, during the past few years, been obliged to relocate outside of the city on account of conditions such as we here call attention to. For the Brooklyn Botanic Garden to move out of the City would spell disaster to a large and important division of our work—our service to the schools and the local public; and yet, if existing conditions continue, we shall face the alternative of doing that, or of giving up all attempts to grow evergreen trees and other kinds of plants that cannot withstand the sulphur dioxide fumes and the soot from burning oil and soft coal.

International Seed Exchange

Over 3,200 packets of seeds were sent to foreign gardens during 1925, and over 1,200 packets were received in exchange.

Our *List of Seeds Offered in Exchange* (published in December) was restricted this year, for the first time, to seeds of woody plants (trees and shrubs), with the intention of including in the 1926 collections seeds of only herbaceous plants.

Our correspondence with foreign and a few domestic insti-

tutions with a view to bringing about a greater degree of uniformity in nomenclature, begun in January, 1923, was continued with the printing and distribution to about 120 gardens and other botanical institutions of *Communication No. 5* (April) and *Communication No. 6* (November). As a result of this correspondence the points of difference between the various institutions are gradually becoming more clearly defined, and many of our correspondents have expressed themselves in favor of an adjustment of these differences by international agreement.

Children's Gardens

Shakespeare Garden.—The curator of elementary instruction has noted the addition of a small Shakespeare Garden to the features that add interest to our children's gardens. This was made possible by the gift of $500 for this purpose by Mr. Henry C. Folger, secured through the good offices of Mrs. Glentworth R. Butler. The gift is acknowledged elsewhere in this report.

Plants of American Indians Grown.—We are indebted to the Museum of the American Indian, Heye Foundation, New York, for supplying to our Children's Gardens seeds of plants that have been cultivated from time immemorial by the Pawnee Indians. The seeds were descended from plants that had never previously been grown by white men. The growing of these seeds by the children aroused a great deal of interest on their part and on the part of visitors to the Garden (see p. 71).

Japanese Garden

The Japanese Garden maintains its popularity, and grows more beautiful each year, as the trees and shrubs develop.

On June 5 we received from Mr. Ernest F. Coe, New Haven, Conn., a noteworthy collection of 32 Japanese Dwarfed potted trees and shrubs, imported by Mr. Coe some time ago from Japan. Several of these trees, including pines, junipers, cypress, oaks, and maples, are of great age. The collection also includes Aucubas, Skimmias, Palms, Azaleas, Wisteria, Euonymus, Bamboo, and Ilex. The curator of Japanese Gardening and Floral Art, Miss Averill, considers these very rare specimens, and of great value for our Japanese Garden.

It was necessary for the Garden to secure from the Federal Horticultural Board and from the New York State Department of Plant Industry (Bureau of Farms and Markets) a special permit to bring the Five-leaved Pines from Connecticut to New York State on account of the quarantine against the Pine Tree Blister Rust.

Library

Special attention is called to the unanticipated uses to which our library is being put by the public, in the way of serving business houses and other interests not strictly botanical. (See the appended report of the Librarian, p. 76.)

We emphasize again the great need of a permanent fund to yield at once an income of not less than $2,000 for the purpose of annual binding and the purchase of books. Ultimately a larger income will be needed. There are no funds in sight for any binding during 1926, although there are over 1,000 volumes needing to be bound.

Herbarium

The Phanerogamic Herbarium has been enriched by over 600 specimens from regions not hitherto represented, or inadequately so. The curator of plants calls attention to the fact that the herbarium cases are now nearly full.

The Cryptogamic Herbarium has had 205 accessions, of which 200 were purchased and 5 received by exchange.

Conservatories

The rare cycads from Australia and elsewhere are fast getting too large for their present quarters and there is no larger house to which they can be moved. Those from Australia were obtained at considerable effort and expense in 1914, and there is only one other similar collection in the United States, namely, at the Missouri Botanical Garden. Unless additional conservatory space is provided within about two years, it is certain that they will die unless they can be suitably disposed of.

Other items of interest may be found in the appended report of the Horticulturist.

Parmentier Tablet

An account of the unveiling of a bronze tablet in memory of André Parmentier will appear in the January (1926) issue of the Botanic Garden RECORD before this report is published. The tablet, which is mounted on a large glacial boulder near the Eastern Parkway entrance, was presented by the Parmentier-Bayer Centenary Commission was unveiled on October 17, 1925. Baron Emile de Cartier de Marchienne, Belgian Ambassador to the United States, was Honorary Chairman of the Commission, and Mr. Henry G. Bayer was Chairman of the Executive Committee.

André Parmentier established the second nursery on Long Island, located on a tract of 25 acres in what was then the outskirts of Brooklyn, at the juncture of the Jamaica and Flatbush Roads—an area now included, roughly, between Sixth and Carleton Avenues and Bergen Street and Atlantic Avenue. While this was a commercial institution it was an important factor in the early development of horticulture in America, and was the first institution in Brooklyn to be called a "Botanic Garden."

Cooperation

Board of Education.—In addition to our regular work with the public schools, our curator of elementary instruction, Miss Shaw, on March 10, gave one of the lectures in a series of three under the auspices of the Board of Education on the general subject of Garden Nature Study, her subject being "The Experimental School Garden." The audience was composed of about 500 teachers.

In May, Public School No. 24 was supplied with labels to mark the trees on the school grounds.

Board of Health.—On June 8 we supplied, on request, to the Board of Health, Borough of Manhattan, 25 copies of our *Leaflet* on "Poison Ivy." Numerous copies have been supplied in former years.

National Federation for Child Study.—On March 4 Miss Shaw gave an address on "Children's Gardening and Nature Study" before the Federation. As a result the Garden, on request, offered a course of five lectures on that subject, primarily for the members of the Federation.

New York University.—By invitation of the authorities of the Hall of Fame, New York University, the Garden laid a wreath at the base of the bust of Asa Gray, which was unveiled on the afternoon of May 21.

A list of the outside organizations that have held meetings at the Garden during 1925 may be found on page 119.

Appointments, Transfers, and Resignations

The following new appointments and transfers have been made:

Mr. Daniel C. Downs, as secretary and accountant, beginning January 19.

Miss Mary Ellen Peck, as Research Assistant, beginning September 1.

Miss Alvhild Linnea Wiman, transferred from Library Assistant and stenographer to stenographer (in the main office), October 3.

Miss Ruth Blankley, as Library Assistant and stenographer, beginning October 16.

Gifts

Contributions of funds, plants, seeds, books, and miscellaneous items are listed on pages 99–106. These have all been acknowledged with the thanks of the Governing Committee. These gifts are doubly appreciated—for their own sake, and for the interest and confidence in our work, of which they are substantial evidence.

Membership

During the year 181 new members were enrolled. The list of members will be found on pages 127–139.

Distribution of Plants.—On April 1–3, 765 roots of Asters (Michaelmas Daisies) were distributed to 74 members who applied in response to notice in the Postcard Bulletin. The supply of Aster roots was soon exhausted and roots of *Boltonia* and *Phlox* were substituted.

On May 7 and 8, 728 surplus bulbs from our collection of Cannas were supplied to 72 members. Thus during the year 1,493 roots and bulbs were supplied to 146 members.

Postcard Bulletins.—For the purpose of keeping members promptly informed concerning flowers in bloom and other items of interest, we inaugurated in March a plan for sending

postcard bulletins at frequent intervals calling attention to exhibits that may be seen to best advantage during the week following the receipt of the card. Three bulletins were sent in the spring and three in the fall. The responses to these cards indicate that they are widely appreciated among the membership. Requests from members for the services of a docent increase each year.

Eleventh Annual Spring Inspection

About 800 members and friends were present at the eleventh annual spring inspection, held on the afternoon of May 12. The weather was ideal. In connection with the garden walk and the serving of tea, there were exhibited in the laboratory building the original paintings of American wild flowers by Mrs. Charles D. Walcott. The success of the inspection was due in largest measure to the splendid cooperation of the Woman's Auxiliary under the chairmanship of Miss Hilda Loines, and in particular to the work of the entertainment committee, under the chairmanship of Mrs. James M. Hills.

Financial

Tax Budget Accounts

The total appropriation in the city tax budget for maintenance was $81,555 as against $80,855 for 1924. The increase of $700 was to provide for the purchase of additional coal (Code 1361, line 1), since the previous appropriation proved to be inadequate. Even with this increase the amount was not sufficient, as was also the case with lines 2, 9, 10, and 16 of Code 1361 (Expenses for Other than Personal Service). Request was made on June 5 for a Supplemental Appropriation, and on June 19 the Board of Estimate and Apportionment passed a resolution approving the transfer of funds from Miscellaneous, New York County, Code 3222 (New York County Fund for Salary and Wage Accruals), to the Botanic Garden Account in the total sum of $3,690. This brought the total appropriation of the City to the final amount of $85,245. The details appear in the appended Financial Statement, Code 1361, lines 1–17.

The amount requested for 1925 was $98,237, an increase of $17,382 over the 1924 appropriation, and $16,682 more than

was granted. The amount requested is based on actual experience and is the least amount with which our present activities can be continued. The difference between the request and the appropriation must be made up from private funds, most of which are secured by annual solicitation—a very uncertain as well as inadequate method of financing our work, and involving a great crippling of our educational and scientific activities.

Private Funds Accounts

a. Income.—The total private funds income for 1925 was $7,486.03 more than for 1924 ($63,024.48 *vs.* $55,543.45).

The total budget for 1925 was $145,436.31, of which 45 per cent. was provided from private funds.

b. Endowment Increment Account.—Special attention is called to the fact that the principal of this account amounted to $26,162.42, as of Dec. 31, 1925. This represents an increase of $5,269.99 over 1924, made up of interest on the principal sum, plus amounts transferred from the income of the various accounts that contribute (according to the Endowment Increment plan) 20 per cent. of their income annually.

Assessed Valuation of Botanic Garden Property

The assessed valuation of Botanic Garden property in 1913 was $2,400,000 (Third Ann. Rept. 1913, p. 32). According to a report from the City of New York, Department of Taxes and Assessments, Borough of Brooklyn (received February 27, 1926), the assessed valuation for the year 1926 is as follows:

Land	$6,500,000
Buildings	500,000
Total	$7,000,000

Needs of the Garden

An itemized statement of our needs was given in my preceding report and need not be repeated here. It is all summed up in the two words, "additional income," emphasizing the fact that this income should be permanently assured as income from endowment. The opening paragraphs of this report deal with this subject. Until they are met, the following needs (not to

FIG. 6. The Japanese Garden. Young natives enjoying native scenery. (P. & A. Photo.)

enumerate them all) should be kept continuously before us: more nearly adequate salaries, a fund for retiring allowances, additional personnel, additional income for plants, books, publication, laboratory equipment, and other items necessitated by the steady, normal growth of our work.

Appended Papers

Reports on Scientific Investigations for 1925, administrative reports of members of staff, the financial statement, and Appendices 1–8 may be found on the following pages.

Respectfully submitted,

C. STUART GAGER,
Director.

REPORTS ON RESEARCH FOR 1925

Plant Pathology

Disease Resistance. By GEORGE M. REED

Investigations with Oat Smuts.—In the last Annual Report mention was made of the discovery of specialized races of both the Loose Smut (*Ustilago avenae*) and Covered Smut (*U. levis*) of oats, which are characterized by their capacity for infecting particular oat varieties. Two races of loose smut were studied and while both of these were capable of attacking a wide range of varieties, yet they could be readily distinguished one from the other. The most significant difference between the two races was the failure of the one obtained from Wales to cause a severe infection of *Avena nuda*, a variety which has proved to be particularly susceptible to the other race from Missouri. Two races of covered smut were also studied. One of these has been grown for a number of years and is capable of attacking a large number of oat varieties belonging to the various species or sub-species of *Avena*. The second race was obtained from Wales and appeared to be confined almost entirely to certain varieties of *Avena strigosa* and to a strain of *Avena brevis*. These same varieties of *A. strigosa* were also susceptible to the other strain of covered smut. *Avena brevis*, however, has proved to be quite resistant, although a few infected plants have been observed.

A large amount of additional work has been done along this line. Numerous collections of both loose and covered smut from various regions have been received and these have been tested upon a few varieties of oats. Several of the collections have behaved in the same general manner but it is possible that differences in behavior would appear if a wider range of hosts was used. A few of the smut collections, however, indicate distinct new races limited in a definite manner to certain particular varieties. Perhaps the most interesting one is that which appears to be capable of attacking Fulghum oats, a variety which has proved quite resistant to the other races. It is also worthy of note that the variety Black Mesdag has proved to be highly resistant to all of the races so far studied.

The occurrence of these specialized races is particularly important in problems of plant breeding and we must recognize the fact that there are distinct races of smut capable of being separated on the basis of their ability to infect different varieties of oats. A particular variety of oats may be resistant to one or more races but susceptible to another and progress in breeding can only be made when these possibilities are taken into account.

Extensive data have been published on the problem of the inheritance of resistance of certain oat hybrids to loose smut, *Ustilago avenae*. The data presented were derived from a cross involving the very resistant Black Mesdag and the very susceptible *Avena nuda* var. *inermis*, and the behavior of their progeny to the Missouri specialized race of smut. The two parents differ in several important respects. Black Mesdag belongs to the *Avena sativa* type. It is a hulled oat with black flowering glumes, numerous awns and two or occasionally three flowers to the spikelet. On the other hand, *Avena nuda* var. *inermis* is a hull-less or naked oat with light colored glumes, without awns, and containing four or more flowers in each spikelet. The results described involved inoculation experiments with the F_2, F_3 and, to some extent, the F_4 generation of hybrids. The general results indicate that resistance to the smut in this cross is dominant, while susceptibility is recessive. The facts are also in close accord with the interpretation that there is a single factor difference between the two parents. Some attention was paid to the inheritance of various morpho-

logical characters and their possible relation to the inheritance of smut resistance. Various combinations of the parental characters were obtained among the progeny. All the results indicate that morphological characters and smut resistance or susceptibility may be combined in various ways and consequently a whole series of new types of resistant oats may be developed.

The studies on the relative susceptibility of selections from a Fulghum-Swedish Select cross to the smuts of oats, carried out in cooperation with Mr. T. R. Stanton, Office of Cereal Investigations, U. S. Department of Agriculture, have been published. The variety Fulghum was very resistant to the race of smut used, while Swedish Select was susceptible. A very wide range of susceptibility in the F_2 families was observed. It was possible, however, to obtain a number of selections which were highly resistant and others which were very susceptible. There appeared to be no correlation between the morphological characters and their susceptibility to the smuts. Certain F_3 families more or less similar to the susceptible Swedish Select proved to be quite resistant.

During the past year the extensive data on the varietal resistance of oats to smuts obtained in cooperation with the Agricultural Experiment Stations of Idaho, Iowa, Kansas, Missouri and Washington, and the U. S. Department of Agriculture, have been published. A very large collection of varieties belonging to the various species of *Avena* were grown in these experiments, which extended over a period of several years.

Experiments with Sorghum Smuts.—The main studies have been concerned with the inheritance of susceptibility of certain hybrids to the covered kernel smut (*Sphacelotheca sorghi*). The progeny of two different crosses, each involving a susceptible and a resistant parent, have been inoculated and their susceptibility determined. One serious difficulty has presented itself in that it has not been possible to obtain the infection of all the individuals which are actually susceptible. Various external factors as soil temperature, soil moisture, soil reaction, which prevail at the time of the germination of the inoculated seed, influence greatly the amount of infection and under field conditions it is not possible to control these sufficiently to secure the invasion of all susceptible individuals. The resistant parents used in each

of the crosses have proved to be remarkably free from covered kernel smut for a period of several years. On the other hand, the susceptible parent in each cross has always given a large number of infected plants. In one of the crosses the F_2 plants have proved to be quite susceptible, almost as many individuals being infected as in the case of the susceptible parent. In the other cross, however, the F_2 plants have all shown a high degree of resistance, relatively few plants being infected. The results suggest that different factors are involved in the two series, but additional studies are necessary before the problems can be cleared up.

Some studies have been made on the head smut (*Sorosporium reilianum*) of sorghum and corn. This fungus is particularly interesting because of its occurrence on both of these crops. In the experiments rather low percentages of infection on sorghum have been obtained, while on the other hand there has been a very severe infection of maize, at least in some of the experiments. The results indicate that the smut collected on corn is not capable of infecting sorghum and likewise that the smut collected on sorghum is incapable of infecting corn.

Cryptogamic Herbarium.—Very marked progress was made in mounting the specimens of the Bubák collection. Practically all of these, with the exception of the higher Basidiomycetes, have been mounted and distributed in the herbarium. This work has involved a great expansion of our storage facilities. Only a few specimens have been added to the cryptogamic herbarium during the year, namely, a total of 205, of which 200 were purchased and five received in exchange.

Forest Pathology

By Arthur Harmount Graves

1. *Chestnut Bark Disease Investigations.*—As stated in the report for 1924 (pp. 42–43), experiments were begun in that year in collaboration with the Laboratory of Forest Pathology, United States Department of Agriculture, to determine the causes and conditions for the development of vigorous shoots from the bases of chestnut trees apparently killed by the blight. One series of experiments was concluded in August, 1925, and

showed very clearly that the roots of the chestnut are much more resistant than the shoots to the attacks of the fungus. In roots and shoots of approximately the same diameter and from the same tree, inoculated with a pure culture of the fungus (*Endothia parasitica*), the growth of the parasite was only slight in the root tissue, but girdled the shoots in all cases. This greater resistance of the roots is probably due, in part at least, to the fact that the root bark contains a much greater amount of tannin than the bark of the shoots and trunk. Recent investigations of the Leather and Paper Laboratory of the Bureau of Chemistry, U. S. D. A., have shown that in the samples analyzed the tannin content of the root bark was more than twice that of the trunk. It is this greater resistance of the roots, therefore, which is making it possible for basal shoots to develop. Usually they soon die off from the disease, but occasionally they become old enough and large enough to bear nuts. This last fact is of tremendous significance in that it will surely enable the tree to postpone still further off into the future its possible extinction. The production of seeds will provide for young trees, and there is always the possibility that some of these will be found still more resistant. These nuts should by all means be carefully gathered and planted. About 100 nuts obtained from such chestnut shoots by boy scouts last fall in Northern New Jersey and a large number which were secured from still vigorous trees at the outer limits of the chestnut range near Portland, Maine, are being planted out on land owned by the writer near Hamden, Connecticut, in the hope of breeding more resistant strains from this and other stock.

2. *Nectria Canker on Paper Birch.*—In experimental work which is being carried on at Brooklin, Maine, on the Nectria canker of the birch, the susceptibility of the paper birch (*Betula alba* L. var. *papyrifera* (Marsh.) Spach. was demonstrated this year. Inoculations in paper birch had been made in 1924, the inoculum having been taken from trees of yellow birch (*Betula lutea*) affected with this disease. None of the white-barked species had been previously affected, but as a result of the inoculations from the yellow-barked species, this year small cankers have been found, in which typical perithecia of *Creonectria coccinea* had developed. This fungus has therefore been found by the

writer to be pathogenic to *Betula lenta* (Mycologia 11: 113–117, 1919), *B. lutea*, and *B. papyrifera*. *B. populifolia* is also probably susceptible and good cankers have been found on trees of this species north of Hollis, Long Island, but no perithecia have yet been observed.

Genetics and Plant Breeding

Investigations on the Laws of Heredity and Variation in Plants

Hardiness and geographic distribution. By ORLAND E. WHITE

Data on some genetic aspects of the cold-resisting ability or hardiness of herbaceous perennials and woody plants and geographic distribution have been collected for a number of years. A preliminary paper covering this study was published in the January, 1926, issue of the Brooklyn Botanic Garden RECORD.

The Genetic Analysis of Peas (Pisum). By ORLAND E. WHITE and DOROTHY I. NEFF

Investigations on inheritance and variation in several hundred varieties of field and garden peas have been carried on in 1925, as in previous years. These varieties, collected from all over the world where peas are grown, include both wild and cultivated types, varieties, and species. Many have very peculiar and little known characters. Through crossing these various kinds, and studying the inheritance of the characters by which they differ, a better understanding of the laws underlying inheritance and variation and their relation to environment is obtained. Year by year, the inheritance of characters previously not investigated is worked out and their relations to the already known facts determined. In this manner, more light on the problems of inheritance in general is secured.

Accounts of these studies have been published and referred to in previous years. The series "*Inheritance Studies in Pisum*" now consists of five numbers. Studies have been completed during 1925 for two more numbers. One of these deals with a very extended study of the inheritance of height in peas and its relation to other characters. The other study involves foliage and cotyledon characters. Four types of foliage color were

studied—ordinary green foliage, yellow foliage designated P34, yellow foliage designated P30 and yellow foliage designated P32. Ordinary green foliage varieties have green unripe pods, and several kinds of seed cotyledons which express when mature the characters—wrinkled green (factors *r*, *i*, *G*), wrinkled yellow (factors *r*, *I*, *G*), smooth yellow (factors *R*, *I*, *G*), smooth green (factors *R*, *i*, *G*).

P34 type has, at first, light green foliage with light yellowish-white stems. These characters can be distinguished without difficulty when the peas first appear above ground. As the plants mature, the foliage becomes more and more yellow. At the flowering stage the lower part of the plants are bright golden yellow, only the growing tips being light green. When first formed the pods are bright green, but these gradually turn light yellow. The ripe seeds of this type are smooth yellow (factors *R*, *I*, *G*).

P30 type also has yellow foliage, but during the growth period it never attains the bright golden character of P34 type. Its leaves are much larger, and more chlorophyll is always present. When combined with two dwarfing characters—small number of internodes (factor *t*) and short internode length (factor *le*)—the foliage remains dark green until the pods are midway mature. Only the stem is characteristically pale whitish-yellow. The pods, as in P34, are at first dark green, later changing to a light greenish-yellow. The ripe seeds of this type are wrinkled and of a peculiar yellow (factors *r*, *i*, *g*). The inheritance of cotyledon color and texture (wrinkled and smooth) in crosses between this type and various green foliage types is discussed in detail in "Inheritance Studies in Pisum, I," and to a slight extent in "Studies" II and IV. Very peculiar results were obtained.

P32 type has green foliage except in the flowering region. As a young plant it is entirely green foliaged. As the floral region develops, the leaf midribs, veins, main stem in this region only, flower peduncles and pedicles, calyx segments and other ordinarily green parts have a bright yellow or yellowish-orange color. When the pods first appear, they are bright orange yellow. Their immature seeds are green and as the seeds develop and the pods mature, the latter become first canary yellow, later greenish-yellow. The ripe seeds are smooth yellow (factors *R*, *I*, *G*).

The original variety from which we obtained the P32 type foliage and pod character is *Wachs Schwert* and it is very probably the yellow pod type which Gregor Mendel worked with and listed among his seven pairs.

Crosses between all these types in all possible combinations have been made. The junior author worked out the inheritance of the foliage and pod colors and their relation to each other in fulfillment of the thesis requirement in botany for an M.S. degree in Columbia University. The genetic factors involved are: ordinary green foliage and the green foliage of P32 type, *O*; P34 type, o_y; P30 type, o_r. Green is dominant to both yellows. P30 type in a sense is dominant to P34 type. The three types form an allelomorphic series. The pod colors are designated *Gp* and *gp*. The expression of the foliage factors modifies the expression of *Gp* in types P30 and P34, changing the pod colors to yellow. Combinations of *gp* and o_y and o_r have been obtained, so *gp* is not to be regarded as always associated with green foliage *O*.

As to the cotyledon factors, the recessive foliage color o_y is very closely linked with the dominant yellow cotyledon color factor *I*, the cross-overs being very rare and less than five per cent. Conversely *O* is linked with *i*. The cross green foliage, green cotyledon × yellow foliage P34 type, yellow cotyledon, hence gives a segregate class—green foliage, yellow cotyledons—that is very nearly always a dihybrid heterozygote. At first the results from this cross were believed to represent a monofactorial difference, the yellow foliage and yellow cotyledons, green foliage and green cotyledons respectively being regarded as expressions of the same factors in different parts of the plants. On this basis, the green foliage, yellow cotyledon varieties would be regarded as a third member type of an allelomorphic series, either the yellow cotyledon type (*IIGG*) or the green cotyledon type (*iiGG*) representing a mutation from the other. That this is not the true explanation has been shown by the discovery of the cross-over classes noted above, $o_y iG$ and *OIG*.

The relations of the factors of the P30 type to the others are very complicated. Owing to the difficulty of distinguishing in some cases between wrinkled yellow and wrinkled green coty-

ledons (except under the most ideal environmental conditions) in crosses involving this type, the writers do not feel absolutely certain as yet regarding the validity of the linkage group $o_r g$–OG (yellow foliage, yellow cotyledons–green foliage, green cotyledons) discussed in "*Pisum studies, IV.*" Both cross-over classes apparently have been obtained, but owing to the environmental complications, as well as others in connection with the modifying effect of the factor *R* (discussed in all three above-mentioned studies), more data are needed. When both *R* and o_r are combined in the same plant with *i* and *g*, the cotyledons are green, as though *G* instead of *g* were present. From such a cross as green foliage, smooth green cotyledon (*iiRRGGOO*) × yellow foliage P30 type, wrinkled yellow cotyledon (*iirrgg*$o_r o_r$) or its reciprocal, F_2 segregate classes representing the expected yellow foliage, smooth yellow cotyledon and green foliage, smooth yellow cotyledon types were absent. The yellow foliage wrinkled green cotyledon type was also all but absent, there being but one among 575 F_2 segregates. The actual F_2 results obtained from a number of these crosses were: 0 GFRYC : 0 YFRYC : 4 + 3? GFWYC : 24 YFWYC : 319 + 1? GFRGC : 119 + 5? YFRGC : 99 GFWGC : 1 YFWGC. In respect to cotyledon color and texture alone, this cross gave all smooth green F_1 and 438 + 6? RGC : 100 WGC : 0 RYC : 28 + 3? WYC in F_2. The expected but absent RYC individuals seem to have been added to the RGC class. Another type of cross in respect to cotyledon color and texture gave results as follows: smooth dominant yellow (*IRG*) × wrinkled recessive yellow (*irg*) gave all smooth yellow in F_1 and in F_2—70 RGC : 3 + 2? WGC : 204 RYC : 100 WYC. The general nature of the results of these crosses as regards the cotyledon characters were mentioned in a footnote in the senior author's earliest study on *Pisum* (see *Amer. Nat.* **50**: 540. 1916, also published as Brooklyn Botanic Garden Contributions, no. 10).

The P32 type, in respect to pod color and its associated yellowish top foliage, is recessive to green foliage, green pod types, as well as to P34 and P30. This character will be referred to as "schwert." So far as we are aware this is the only yellow pod variation of this type in peas. The P32 type in respect to cotyledon color and texture, foliage color and the "schwert"

character is *IRGOgp*. Taking into consideration only cotyledon color and texture, this type when crossed with all ordinary green cotyledon types gives an F_2 9 : 3 : 3 : 1 ratio. Crossed with the P30 type (*irg*) an F_2 ratio of 13 yellow : 3 green is obtained, with complications respecting the *R* factor as described above. Over a hundred commercial varieties with yellow cotyledons obtained from many different parts of the world, including the P34 type, also give the 13 : 3 ratio when crossed with P30 type.

Studies of the Variation of the Boston Fern (Nephrolepis). By R. C. BENEDICT

Experimental work on *Nephrolepis* forms has been continued along the lines of previous years; namely, the maintenance of numerous bud variations for further observation, and the experimental raising and study of various lines derived from the spore-fertile strain.

In this latter field the testing of disease susceptibility in one form has been carried out, involving the raising of a large number of plants. New cultures of other spore-fertile types have also been raised in considerable numbers.

Systematic Botany

The Classification of Dicotyledons. By ALFRED GUNDERSEN

During 1925 I have continued studies relating to the general classification of dicotyledons. I have given chief attention to the question of the position of the herbaceous, apetalous dicotyledons, particularly the "Centrospermae" (Order Caryophyllales). Notes and drawings have been made of the structure of flowers and flower buds, and of seeds and ovules of certain groups. Forms of the Families Caryophyllaceae and Portulacaceae have been compared with forms of Families of the Order Parietales, such as Frankeniaceae, Elatinaceae, and Tamaricaceae. Among these groups numerous corresponding structures appear, in particular pearly ovules and rather long funiculi are characters widely distributed. Evidence is accumulating that the Centrospermae may be most naturally regarded as a branch from the Parietales, while the Parietales, with frequent spiral arrangement and other characters, must be considered as very near the Ranales.

Ecology and Plant Geography, and Flora of Long Island

The Vegetation of Long Island. By NORMAN TAYLOR

Work was continued but, due to restricted appropriations, upon a reduced scale. It is hoped that the work may be pushed during the next year or two towards the publication of "The Forests of Long Island."

Hydrogen-ion Concentration of Fresh and Stored Soils.
By HELEN SMITH HILL

Numerous writers, including Wherry, have claimed that stored and fresh soils give the same reaction when tested for hydrogen-ion concentration. In over seventy samples certain of the Long Island soils gave Ph values from 1.0–2.4 differences as between fresh samples and those stored for one year. In all cases, except one, the change was from an acid to a more alkaline condition. An account of these changes and their possible significance will be printed shortly.

Soil Fertility. By NORMAN TAYLOR

Apart from their purely physical characteristics, the soils of Long Island from one hundred and thirty different sites, depths, and plant associations have been studied with reference to their fertility. This has involved cultures under control conditions of many pots of soil, as well as one hundred and seventeen soil extract experiments, where plants were grown in chemically pure crushed quartz and watered with the different extracts. The results are still incomplete, and it is proposed to carry on this work more extensively during 1926. Of particular interest is the fact that over great stretches of Long Island geologically similar material has resulted in a quite diversified soil and vegetation response. While a great deal of work along similar lines has been done in Russia, work in this country has been largely upon agricultural soils. All of the Long Island soil studies have been on wild land, including surface and under-the-surface samples from:

Oak-Hickory Forest
Pitch Pine Forest
White Pine Forest
Deciduous Forest (Beech, Tulip, Sweet Gum, etc.)

Elm Forest (near North Beach)
Grasslands (Hempstead Plains, Shinnecock Hills, and Montauk Downs)

Flora of Long Island. By NORMAN TAYLOR

Only meagre collections were made during the year, again due to insufficient funds. The recent and continuing real estate boom, especially on the eastern end of the island, makes it not only imperative to gather all the data possible while it can still

FIG. 7. Parmentier Tablet. The unveiling. Standing (from right to left), General George A. Wingate, the Belgian Consul (Mr. J. T. Johnston Mali), Mr. Henry G. Bayer, and Miss Helen A. Condon, who unveiled the tablet. (5695.)

be secured, but also makes the potential demand for a flora most encouraging. We have continued to keep the manuscript catalog of the "Flora of Long Island" posted to date, including valuable additions from William C. Ferguson, Esq., but much work remains to be done.

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I take pleasure in submitting herewith my report for the year ending December 31, 1925:

Lectures, Classes, and Attendance

On account of lack of funds the special Saturday and Sunday public lectures for adults were discontinued during 1925. This I feel is not as it should be, for this feature is a field of service for which the Garden is eminently fitted. I earnestly hope, therefore, that in the future it may be found possible to set aside a fund for this purpose.

In regard to the attendance of regular and visiting classes of adults and children at the Garden there has been a slight increase, this year's total being 88,694 in comparison with 81,567 of last year. This year's figure is nearly double that of 1921 (48,819), mainly due to the increased demands on the Department of Elementary Instruction. The number of children attending lectures this year (45,629) is more than double that of last year (20,846). The following table shows the growth in these lines of activity for the last five years.

TABLE I

ATTENDANCE IN CLASSES FOR ADULTS AND CHILDREN AND AT PUBLIC LECTURES FOR CHILDREN, 1921–1925

	1921	1922	1923	1924	1925
Regular Garden Classes	24,008	19,654	25,710	31,684	29,931
Visiting Classes	24,811	40,529	53,132	49,883	58,763
Public Lectures for Children	11,637	16,850	18,096	20,846	45,629
Total	60,456	77,033	96,938	102,413	134,323

The registration as recorded by the turnstiles at the entrances to the Garden shows a much greater use of the Garden by the general public than last year, the figures for 1925 being 504,595 in comparison with 438,091 of last year. The number of visitors

to the Conservatories was slightly smaller than last year. The following table gives detailed attendance by months.

TABLE II

ATTENDANCE AT THE GARDEN DURING 1925

	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular classes	781	1,268	1,484	1,706	2,614	2,145	3,600
At visiting classes	360	1,160	8,527	9,657	16,132	4,688	549
At lectures to children	375	550	6,519	6,999	12,485	3,958	386
At lectures to adults	0	0	252	100	160	50	60
At conservatories	779	1,334	2,280	3,426	4,009	978	1,751
Total registration at gates	12,096	20,619	41,481	66,229	73,371	40,060	52,703

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals
At regular classes	4,320	3,851	3,652	2,170	2,360	29,931
At visiting classes	540	325	7,197	4,398	5,230	58,763
At lectures to children	405	0	4,854	4,098	5,000	45,629
At lectures to adults	10	0	0	0	0	632
At conservatories	2,347	1,622	1,447	2,065	1,239	23,277
Total registration at gates	53,721	47,389	53,906	27,962	15,195	504,732

Study Material Supplied to Educational Institutions

As in my report for 1924, it is again pleasant to record the rapid growth of this part of our work. As was the case last year, this field has been in charge of my assistant, Miss Charlotte S. Young, who is building up and strengthening many lines of contact not only with the public schools but with colleges and universities. Over 300 requests for material were received in 1925, and 162,585 pupils used study material of one sort or another, furnished by us. There has been an increasing demand for sterile nutrient agar supplied by us for the study of molds and bacteria. In this the Garden surely fills a very real need, for it would indeed be an expensive proposition for the City to install an autoclave and laboratory for each school where bacteria and molds are studied, such study occupying as a matter of fact only a small portion of each school year. At the Garden the autoclave and laboratory are a necessary adjunct of scientific research projects. The following table sets forth the growth of this work for the last 4 years.

TABLE III

Year	Requests for Material of Various Sorts	Petri Dishes Filled	Number of Pupils Reached
1922....	48	358	5,398
1923....	110	664	24,348
1924....	146	1,180	161,450
1925....	324	1,752	162,585

Further development of our sets of loan slides for schools has come to a standstill on account of the lack of funds. When once obtained these would of course become a permanent part of the equipment, and would be of immense value as illustrative material for the school children.

Personal Class Work

In 1925 a new course in botany entitled "The Life of Plants" was announced. This course runs through the school year and is designed for any who wish to obtain a working knowledge of plant life. The courses on "The Trees and Shrubs of Greater New York" were given as usual in the spring and fall, 70 people registering for the Spring Course and 40 for the Fall Course.

News Releases

As during the past four years, we have continued sending weekly accounts of activities of the Garden to thirty-eight periodicals, including various metropolitan dailies in New York and elsewhere, several Long Island papers, and other publications. Recently the *Hartford Courant* (Hartford, Conn.), the oldest newspaper in the United States, has asked to have our weekly press releases. An editorial on work of the Brooklyn Botanic Garden was published in this paper in December. Our news items are copied by papers throughout the country, recently articles relating to the Garden appearing for instance in the *Herald-Examiner*, Chicago, Ill., in the *Los Angeles Times*, and in the *Province*, Vancouver, B. C. During 1925, 105 typewritten pages of press releases were issued, containing 84 articles.

Editorial Work and Other Activities

As usual, I have continued to serve on the Editorial Board of the *American Journal of Botany*, as well as acting as Assistant

Editor of the Botanical Education Section of *Botanical Abstracts*. I have also edited the 1925 series of Brooklyn Botanic Garden *Leaflets*, consisting of 10 numbers. In January, 1925, I was re-elected Secretary of the Torrey Botanical Club.

Scientific Investigation

In the section entitled Report on Investigations will be found an outline of my work during 1925 in Forest Pathology. This, as in the past, is carried on in cooperation with the Office of Investigations in Forest Pathology, U. S. Department of Agriculture, of which I am a collaborator.

Respectfully submitted,

ARTHUR HARMOUNT GRAVES,

Curator of Public Instruction.

REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I hereby present to you the thirteenth annual report from the Department of Elementary Instruction.

Work with visiting classes has increased over that of the preceding year, the attendance (in this Department alone) being about 9,000 more than that of last year, making a total attendance of a little over 57,000. Registration in our teachers' classes also has increased; while the registration in the children's classes has dropped slightly, due to lack of classroom space. Attendance in the summer garden of 1925 was practically the same as in 1924.

Three syllabi, for use with visiting classes, have been written this year, on *Cotton*, *Rice*, and *Sugar*, by Miss Mabel E. Turner, instructor in the Department until July first. She was succeeded by Miss Ethel V. Woodward. Two fine motion picture reels on "Oranges and Peanuts" were presented by the Alexander-Leggett Company of New York.

A new feature has been added to the children's garden, a Shakespeare Garden, the gift of Mr. Henry C. Folger, made possible through the interest of Mrs. Glentworth R. Butler.

This little Shakespeare Garden lies at the south end of the children's garden area, with evergreens as a background. Fifty-six different plants mentioned by Shakespeare are in this garden. Next season will see it well established.

The children have taken great interest in a little experimental plot called "Our Indian Garden." Seeds of squash, corn, beans,

FIG. 8. Children's Garden Exhibit. Pupils of Public School 182 bringing part of their exhibit. Flowers and vegetables raised in their school garden from seed supplied by the Brooklyn Botanic Garden, Sept. 25, 1925. (5616.)

and sunflower were presented by Dr. Melvin Gilmore of the Museum of the American Indian, Heye Foundation, New York City. These seeds came from the Pawnee Indians. The results of this work have been sent to the Indian Museum. Three gates in the formal flower garden were dedicated, one to Bessie

Bates, daughter of Mrs. Mary Bates Spalding; one to Mrs. Glentworth R. Butler, and the third to Dr. C. Stuart Gager. The perennial border, started in 1924, was a thing of beauty this season.

A series of exhibits, for teachers and children, has been inaugurated. Three such exhibits were given during the spring of 1925; two in the fall. The spring exhibits were as follows: March 24—Economic Plants; April 29—Plant Friends and Enemies; May 21—Exhibit of Wild Flowers, Trees and Weeds. The fall exhibits were held on November 12—Harvest Exhibit, and on December 8—Christmas Greens. This last was given in cooperation with Mrs. Clarence R. Hyde, who was to stage an exhibit of substitutes for Christmas greens in the interests of plant conservation, and since both exhibits were planned for the same time, it was decided to combine them. This exhibit was open to the public from December 8 to 23. All the exhibits were well attended.

During the spring a special class for greenhouse work was formed by the Child Study Association of New York. This was a six weeks course. A course was planned also for a group of students from the Shore Road Academy. Hunter College sent classes during December for work on plant propagation. Girls' Commercial High School has availed itself of the opportunity for special classes in greenhouse work. The Curator of Elementary Instruction gave a series of talks on gardening over the radio for Station WNYC, New York, during March and April. A little series of talks was requested by the Birch-Wathen private school of Manhattan. Three such talks have been given.

Instruction for second-class scout tests in the study of trees and plants has been given at the Brooklyn Botanic Garden to the Girl Scouts by the assistant curator. This work has continued through the year.

Monthly exhibits have been set up in the Children's Room of the Eagle Building. An exhibit of our work was requested by the Nature Study and Garden Section of the Michigan State Teachers' Association, and was sent to Grand Rapids for their spring meeting. The exhibit consisted of a number of large posters displaying photographs and printed matter pertaining to the work of elementary education as carried on in our institution.

The price of seed, distributed to the schools of the Borough, was reduced from two cents a packet to one. Over half a million packets were distributed.

The Children's Garden Exhibit was held September 25, 26, and 27. This is the last of our series. These exhibits were started to stimulate an interest in school gardens and back-yard gardens in the Borough of Brooklyn. Since this work now forms a part of the work of the Board of Education, and has a director, Mr. Van Evrie Kilpatrick, there is no need of further

FIG. 9. Children's Greenhouse. Group of 20 boys with wooden implements for plant propagation work, made by the boys themselves and presented to the Botanic Garden. Ready for a lesson. June 2. (5452.)

stimulus from the Brooklyn Botanic Garden. Our last exhibit was an unusually fine one, showing the results of years of work. The judges on this occasion were as follows: Mr. Van Evrie Kilpatrick, Director of Nature-Garden Work for New York City; Mrs. William H. Good (Mr. Louis Buhle, alternate, acting), and Mr. Arthur Dore, Managing Editor of the Brooklyn *Citizen*. The prizes were presented on October 24 by Dr. C. Stuart Gager

and Mr. Van Evrie Kilpatrick. Special prizes given at this time were as follows: two cups for outstanding work done by boys in our own garden, to Robertson Pratt and Bernard Goodman, by Miss Helen G. Woodruff, acting for the Garden Teachers' Association of the Brooklyn Botanic Garden; the Butler cup, for excellent work done by a girl, to Esther Kroesen, by Mrs. Glentworth R. Butler; four garden books to Eleanor Garden and Eleanor Chambers, by Mrs. Carson of the Flatbush Garden League; a garden book for special work to Virginia and Frances Schrader, by Miss Alice Driggs; and two gold honor pins to Gertrude Adelman and Bernard Goodman, by the Curator. Mrs. Butler presented to the Children's library a book on "The Shakespeare Garden," given by Mrs. Adrian Van Sinderen, and an olive-wood box containing samples of woods from the Holy Land, a souvenir of her recent trip to the Holy Land.

Some special things have happened in the Department which might well be stressed in this report.

May 13 the Heads of the Department Association of Brooklyn held its meeting at the Brooklyn Botanic Garden.

December 19 was the date of the children's annual Christmas party, made delightful through the kindness of Mrs. Butler, who told personal reminiscences of the Holy Land and showed costumes from there; Mrs. Teresa Wolfe Rashkis, who sang folk-lore and Christmas songs; and Mrs. Orland E. White, who told a Christmas story. The usual presentations were made from the children to the Garden. A bunting flag for their own outdoor garden and a smaller bunting flag mounted on a flagpole were the gifts for 1925. The *Agricola*, our Boys' and Girls' Club Magazine, presented $25 in gold to the Director toward the endowment fund, and the Treasurer of the Boys' and Girls' Club presented a second $25 in gold for the same purpose. Mrs. Glentworth R. Butler presented to the *Agricola* a fine Underwood typewriter, a gift from Mr. Underwood himself, who is one of our trustees.

In closing this report I would like to speak of the untiring zeal and kindness shown by Mrs. Glentworth R. Butler in making gifts possible for the Department's work, and also of the understanding spirit she has shown toward its ideals.

I would speak too of the various gifts of books, pictures and slides presented by individual members of the Woman's Auxiliary, old students, and other friends of the department.

The department suffered a loss when its stenographer, Miss Laura Brewster, resigned. Miss Brewster for five years had been a faithful and almost indispensable part of the work.

Little has been added to our equipment this year. Two cabinets for supplies are being built in room 327, the class-room-laboratory.

I would stress for 1926 the purchase of more colored lantern slides for class work and work with the Scouts; an auto-bus for transportation of visiting classes; a small car to be used in making visits to schools, and in the delivery of seeds. There should be a sum annually for the establishment and maintenance of a fellowship in education open to any college-graduate student interested in such work as the Department of Elementary Education is carrying on at the Brooklyn Botanic Garden.

Personal Activities

Plant Stories for the Junior House Magazine have continued throughout the year, being written one every other month. In addition to this, I still act as National secretary of the National Plant, Flower and Fruit Guild, and as Managing Editor for their Magazine.

I visited Goldsmith College, a training college for teachers and a part of the University of London, in June for the purpose of observing the work in nature study. I spoke briefly to the students of this department concerning our work. A representative of the School Nature Study Union of England called upon me to request an article for their organization on our work, to be written in 1926. It was at this time that I was entertained by Sir Thomas Lipton, who presented us with motion-picture reels on "Tea" in 1924.

Respectfully submitted,

ELLEN EDDY SHAW,

Curator of Elementary Instruction.

REPORT OF THE LIBRARIAN FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I have the honor to submit herewith my report as librarian for the year ending December 31, 1925.

We are able to report that the nucleus of the Boys' and Girls' Club Room collection, numbering 156 volumes, has been catalogued and prepared for use, and is now ready to be turned over to the Club Room library where the books will be permanently shelved.

Accessions

Of the 365 volumes added to the collection, 115 were secured by purchase, 92 from the binding of serial volumes, and 77 through exchange. Among the more important titles acquired are the *Bibliotheca Genetica; Mededeelingen*, Nederlandsch-Indie, Department van Landbouw; *Bullettino*, of the Orto Botanico, R. Università di Napoli; *Bulletin* of the Muséum National d'Histoire Naturelle, Paris; Reiche's *Flora de Chile;* and the *Abhandlungen*, of the K. K. Zoologische Botanische Gesellschaft, Vienna.

The three titles added to our collection of rare and early printed books, which were purchased with the income from the Benjamin Stuart Gager Memorial Fund, are the first edition of *Le Floriste François*, by De La Chesnee Monstereul, printed at Caen in 1654; John Evelyn's *Kalendarium Hortense, or, the Gard'ner's Almanac*, London, 1699; and an Italian edition of the *Herbolario Volgare*, Venetia, 1539.

Periodicals, Serials, Documents

Among the new serial and periodical titles are publications from the Bergens Museums, Bergen, Norway; *Contributions*, Boyce Thompson Institute for Plant Research, Inc.; *Verhandlungen* des Botanischen Vereins der Provinz Brandenburg; *Mededeelingen*, Instituut voor Plantenziekten, Buitenzorg, Java; *Candollea; Annual Report*, Carnegie Institution of Washington, Department of Genetics; *Mitteilungen*, Deutsche Dendrologische Gesellschaft; Hilgardia; *Forest Bulletin*, and *Indian Forest Records*, Forest Research Institute, Dehra Dun, India; *Report*, Pomological Station at Coonoor, Burliar and Kallar Fruit

Gardens, India; *Bulletin*, London Iris Society; *Bulletin*, Société d'Horticulture de Madagascar; *Archivio Botanico*, R. Università di Modena, Italy; *Natural History; New Jersey Dahlia News; Resumptio Genetica; School Nature Study Union publications; Science Reports, Series 4*, Tohoku Imperial University, Sendai, Japan; *Tropical Woods; Welsh Journal of Agriculture; Mitteilungen*, Botanischen Museum der Universität, Zurich.

Binding

193 volumes were forwarded to the binder, mainly serials. I cannot recommend too strongly the need of binding at least 500 to 700 volumes a year, in order to include not only serials, but also the titles which are deteriorating in the book collection for lack of binding. We should also begin binding completed sets of agricultural experiment station titles, for which funds have not been available heretofore.

Inter-Library Loans

Twenty volumes were loaned during the year to the Biological Laboratory, Cold Spring Harbor, L. I.; Carnegie Institution of Washington, Department of Genetics, Cold Spring Harbor; Columbia University of New York; Erie, Penn., Public Library; Haaren High School Library, New York; and Syracuse University Library.

Fifty-four volumes were borrowed for the use of the Garden Staff from the American Geographical Society; Brooklyn Museum Library; Brooklyn Public Library; New York Public Library, and the library of the U. S. Department of Agriculture.

Reference Work

It may be of interest to call attention to the diverse groups that use this library. Though our numbers are small, when compared with public library statistics, it is a significant fact that the library serves not only an educational need, but an economic one as well. We have helped such business firms as the American Milk Products Corporation, the Bayer Company, the Metropolitan Life Insurance Company, the National City Bank, and the Western Union Telegraph Company. Either

their representatives called for the information found by us, or the information desired was furnished them over the telephone.

Writers of short stories, journalists, nurses, a motion picture scenic designer, a university lecturer on interior decoration, are not usually thought of as types of readers in a botanic garden

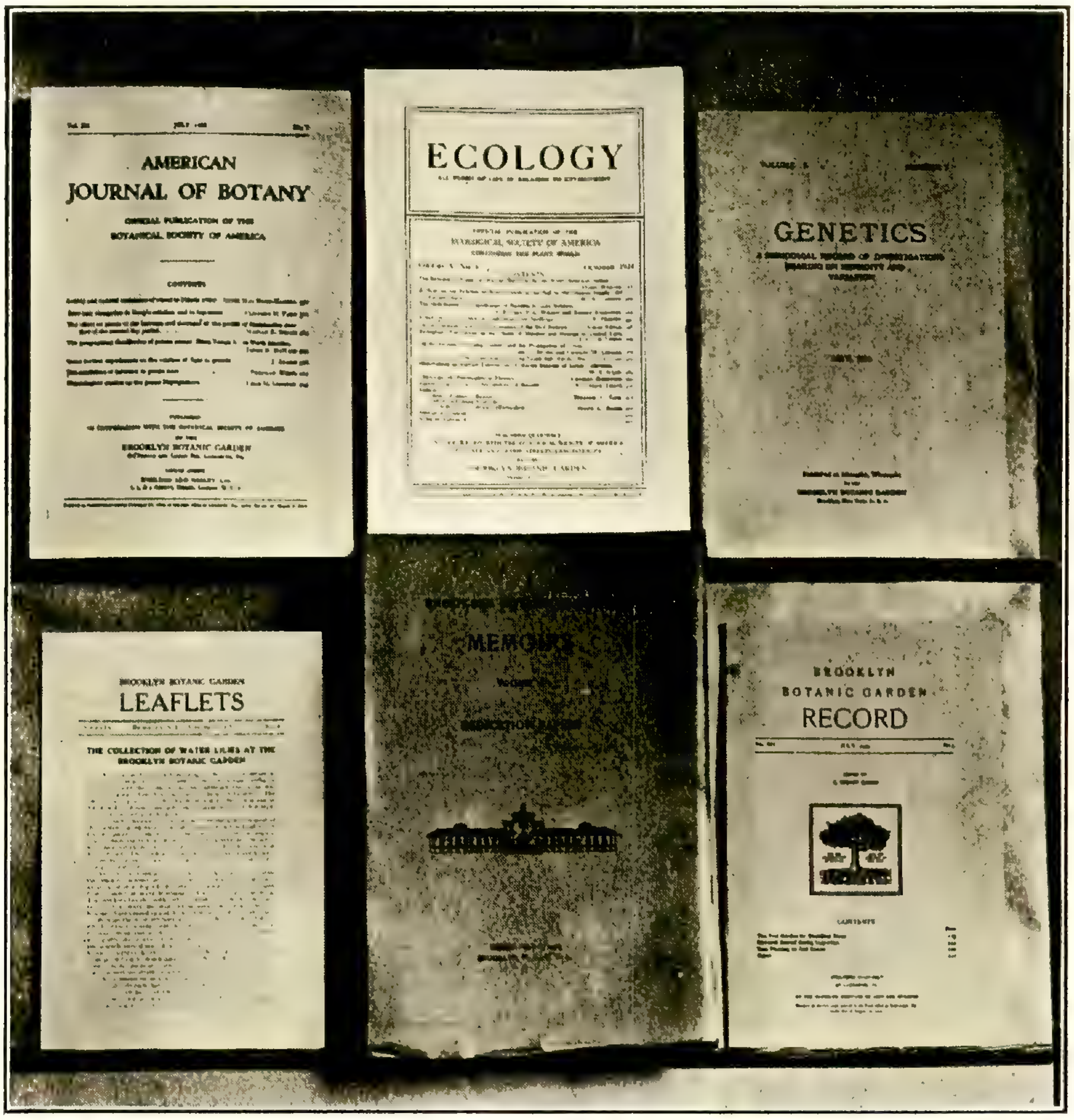

FIG. 10. Publications of Brooklyn Botanic Garden. (5673.)

library. Yet these, as well as landscape architects, horticulturists, teachers, and students have been aided in their work with the collection at hand.

Miscellaneous

The New York Regional Group of Cataloguers met at the Garden on May 23 for one of their regular meetings.

The Junior Class of the New York Public Library made its annual visit on May 29th.

The library was represented at the New York Library Club, the Conference of Eastern College Librarians, the New York Regional Group of Cataloguers and the Special Library Association. The librarian also visited, among others, the libraries of the L'Institut National d'Agronomique, and that of the Jardin des Plantes while in Paris. It is due to one of these visits that our duplicate volumes of Soil Science were donated to the library of L'Institut National d'Agronomique.

There are now approximately 1,355 volumes in the overflow collection, shelved in the lower stackroom.

For list of donors and gifts, see Appendix I.

The statistical report follows:

STATISTICAL REPORT ON THE LIBRARY

Accessions

	Volumes	Pamphlets	Parts (Including Periodicals)
Exchange	77	247	3,835
Gift	81	164	1,596
Publication	0	104	370
Purchase	115	3	680
Bindery	92	0	0
Deposit	0	0	10
Total	365	518	6,491

Total number of parts of publications added to library during 1925, including current periodicals	6,491
Total number of volumes in library, December 31, 1924	10,414
Number of volumes added during 1925	365
Total number of volumes in library, December 31, 1925	10,779
Total number of pamphlets in library, December 31, 1924	7,160
Number of pamphlets added during 1925	518
Total number of pamphlets in library, December 31, 1925	7,678

Total number of volumes and pamphlets in library, December 31, 1924	17,574
Number of volumes and pamphlets added during 1925	883
Total number of volumes and pamphlets in library, December 31, 1925	18,457

Serials, Periodicals, and Documents

No title has been included in this list unless a number has been received during 1925.

Subscription	80
Gift	72
Exchange	580
Deposit from Brooklyn Public Library	2
Publication	10
Total	744

Cataloguing

Books, Pamphlets, and Serials catalogued	1,288
Catalogue cards typewritten	1,215
Shelf list cards typewritten	530
Pamphlet cards typewritten	505
Current periodical cards typewritten	87
Total catalogue cards typewritten, revised, and filed	2,337
Torrey Botanical Club index cards on file, December 31, 1924	33,182
Filed during 1925	1,488
Total number Torrey Botanical Club index cards on file, December 31, 1925	34,670
Index Algarum Universalis cards, December 31, 1924	15,604
Index Algarum Universalis cards received, not previously reported	3,915
Total, December 31, 1925	19,519

Miscellaneous

Attendance in library	8,127
Books loaned to members of staff	1,810
Books loaned to other institutions	20
Books borrowed from other institutions	54

Respectfully submitted,

RAY SIMPSON,

Librarian.

REPORT OF THE CURATOR OF PLANTS AND PLANTATIONS FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I take pleasure in submitting the following report of activities during 1925.

Three considerable areas are still in an unfinished state as to grading and putting down of lawn. The largest, between the Reservoir and the Museum at Eastern Parkway, it has not been possible to grade and plant for lack of enough men, though some work has been accomplished. Perhaps this may be done during the fall of 1926, after we reap the benefits of several more months of tillage, rotation of crops, and other operations, incident to soil improvement.

A second area is the hill west of the Japanese Garden. During the year this has been graded, plowed where possible, and hand dug where necessary, in preparation for development in 1926. The third area, south of the Reservoir fence, remains untouched.

In connection with the Parmentier-Bayer Celebration, a considerable area near the Eastern Parkway gate was surface-graded, seeded down for the first time, and the paths in the vicinity of the tablet boulder re-surfaced and put in shape.

Other work completed during the year may well be summarized thus:

1. Setting arches at Children's House and fence to bound the Shakespeare Garden.
2. Repair of water main beneath the Museum embankment. This was more than seven feet below the surface and involved cutting through one of our main paths and re-surfacing it. In the near future it appears likely we may face more such work, as all except a small section of our water mains are old and badly rust clogged.
3. Laying additional water pipes to the Rock Garden.
4. Repair of large section of the old flagstone sidewalk along Flatbush Avenue. This is sagging in many places, and while not actually unsafe, has been the cause of complaints both from citizens and the police.

Barbed Wire

It is a somewhat disturbing commentary upon our efforts to beautify the Garden that when special collections or areas are brought to as near perfection as our funds will permit they almost immediately become the target for thoughtless, or in some cases deliberate, vandalism. While we have encouraged the use of the lawns for that leisurely walking through the collections which it is one of our prime objects to promote, we are constantly forced to protect special points which appeal to that section of our visitors who see in the Garden nothing but a playground,—and a rather primitive playground. Unchecked, such vandalism destroys what we have been trying all these years to create, and to guard what has been accomplished, to preserve for that other section of the public who do appreciate the difference between a playground and a garden, we have put barbed wire fences at certain strategic points. It is a somewhat hideous method of preserving the beauty of the Garden, and I call attention to it here, not because the problem is new, but on account of the importance of it and its extent. Perhaps the best indication of the latter is the fact that we erected over 2,000 feet of barbed wire fencing this year. And much more was put up in previous years.

Labor Conditions

With something over forty acres in need of constant attention, the number of laborers during the growing season was as follows:

Total for the season		11
Deduct		
Assigned to gardeners	2	
To experimental garden	1	
To the paths	1	
	4	4
Total effective men for general work on the grounds		7

With only seven men for lawn mowing and all the scores of odd jobs of construction, repair and replacement, for the digging of holes for the gardeners, occasional guard duty, and other work, it is obvious that we need at least ten or twelve men for

this force, in addition to regular assignments as outlined above. Under present circumstances the general condition of the grounds, while a subject for congratulation, is not yet up to the standard we aim for, and still is our best argument for increased appropriation for common labor.

Personal Activities

I have cooperated with the Boyce Thompson Institute for Plant Research upon a problem of the specific-gravity tolerance of certain brackish water weeds found in tidal streams, in connection with some work of theirs on duck feeds. Also, as in the past, the Long Island State Park Commission has called for some advice upon the acquirement of certain lands for State Park purposes. I have also continued to serve on the Executive Committee of the board of trustees of the Long Island Historical Society.

Respectfully submitted,

NORMAN TAYLOR,

Curator of Plants and Plantations.

REPORT OF THE CURATOR OF PLANTS FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I herewith present my report for the year 1925.

Collections

Among plants of special interest added to the collections of living plants last year may be mentioned, of hardy plants: *Gordonia alatamaha*, pistillate plants of *Leitneria floridana*, large-fruited forms of highbush blueberry (*Vaccinium corymbosum*); of conservatory plants: Jack-fruit (*Artocarpus incisa*).

An inventory of conservatory dicotyledons (except Cacti) taken in January showed the number of genera of these to be 400, the number of species 737.

During the spring and fall all maps of woody plants were remade on more convenient larger forms. The Saxifragaceae group especially was studied before rearrangement, necessary to exhibit the species. In other families a number of hedges were planted,

as of lilac, rose-of-sharon, and others, to better delimit the families.

The Iris Plantings have been in the special care of Dr. George M. Reed, who reports as follows:

The Garden now has an excellent collection of varieties of tall bearded irises, the total number represented being approximately 375. During the past year, Mrs. C. S. McKinney and Mrs. E. A. S. Peckham sent to us a few varieties. Seventy-eight varieties were obtained from the American Iris Society, which replanted its extensive collection at the New York Botanical Garden and sent us a number of varieties which we had requested. Mr. Robert Wayman, Bayside, L. I., presented to the Botanic Garden 108 varieties. His contribution is a very valuable one since many of the varieties sent are recent introductions, while the others were valuable older varieties which we did not have in our collection. A special bed has been prepared and devoted to twenty of the best tall bearded varieties, based upon the symposium of the American Iris Society.

An attempt is being made to grow several species belonging to the sections *Oncocyclus* and *Regelia*, and hybrids between members of these two sections. A special cold frame has been prepared and a number of species and twelve varieties of hybrids have been planted.

Our collection also contains a number of interesting varieties obtained by crossing the *Oncocyclus* and *Pogoniris* group. The collection at the present time includes Anemopsis, Dilkush, Lady Lilford, Nazarin, Parsam, Paracina, Semele, Shushan, Sir Trevor Lawrence and Zwanenburg. Several of these bloomed successfully last year while the others have recently been added.

Labels and Signs

Labels and signs were made in our Label Department by Mr. John McCallum, as follows:

Steel labels for the herbaceous beds	203
Family labels for the beds	8
Lead labels for woody plants	74
Lead labels for conservatory plants	101
Lead labels for rock garden	36
Small wood labels	163

Large wood labels for horticultural forms	23
Wooden signs	46
Cardboard signs	425
Total	1,079

Also, numerous miscellaneous numbers and signs.

International Seed Exchange

In order to simplify the work in connection with the increasing number of requests, seeds from woody plants only were collected the past year. During the coming year we plan to collect seeds from herbaceous plants only.

Correspondence with other gardens regarding the possible formation of an International List of Genera of Plants Cultivated in Botanic Gardens was continued. Communication No. 5 (April 1925) contained replies from sixteen botanic gardens to our appeal for international agreement as to genera and listed about a hundred frequently used generic names, as to which there is a difference between the most widely used general authorities. In Communication No. 6 (November 1926) the replies received from eleven botanic gardens were published. On the basis of the information now at hand it is intended to publish a second preliminary list of genera, arranged by families as desired by a majority of gardens, indicating the more or less generally accepted names.

Phanerogamic Herbarium

Among the collections acquired last year were 206 specimens of Roumanian plants from the Botanic Garden of Cluj, 62 specimens from South China from Canton Christian College, 50 specimens from Brazil from Miss B. Lutz, 70 specimens from Palestine from Dr. and Mrs. Glentworth R. Butler, 145 specimens of Long Island plants from Mr. W. C. Ferguson, and 85 specimens of *Carex* from New York State Museum.

About 1,000 specimens were mounted and distributed by Miss Margaret Ellis, curatorial assistant. The present cases are now almost entirely full.

Lectures and Class Work

During March I gave three lectures on "Evolution in Flowering Plants"; during May and June eight outdoor lessons on "Spring Flowers and Ferns"; during the fall six outdoor lessons on "Fall Flowers and Fruit."

Personal Activities

During the year I acted as chairman of the field committee of the Torrey Botanical Club. In the fall I began work on an abridged, revised edition of Dr. G. T. Stevens's illustrated *Guide to the Flowering Plants of the Northeastern States*.

Statistics

Living plants received during 1925:

From cuttings	15
By collection	7
By exchange	73
By gift	135
By purchase	365
Derived from seed	269
Total	874

Living plants distributed:

By exchange	262
To members:	
(Aster, Boltonia, Phlox)	765
(Canna)	728
Cuttings	6
Total	1,761

Seeds received:

By collection	144
By exchange	1,235
By gift	40
By purchase	95
Total	1,514

Seeds distributed:

By exchange	3,205

Herbarium specimens received:

By exchange	217
By gift	367
By purchase	62
Total	646

Herbarium specimens distributed:

By exchange	11

Respectfully submitted,

ALFRED GUNDERSEN,
Curator of Plants.

REPORT OF THE CURATOR OF PLANT BREEDING AND ECONOMIC PLANTS FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I beg to submit herewith my report for the year ending December 31, 1925.

In addition to the investigational work on peas and "hardiness" in plants mentioned in the Reports on Research for 1925 (p. 60), I have continued in charge of the "Ecological Section"—with its various exhibits and demonstrations showing how plants are fitted to cope with their environment. Although beautifully situated, the section falls far short of what it could be made to be with the assistance of an expert gardener.

Considerable time has been spent on the economic plant collections, both indoor and outdoor. Material for lantern slides, demonstration exhibits and teaching is being accumulated.

As for several years past, I have been editor of the Genetics Section of Botanical Abstracts, which involves the editing, abstracting and securing of abstracts of over eight hundred papers and books annually.

In April, I became one of the officers and a member of the board of directors of the John Burroughs Memorial Association.

During my vacation in August, I was appointed to the staff of the Institute of Politics, Williamstown, as secretary of the Round Table Conference on Agriculture and Population Increase, of which Professor E. M. East of Harvard was leader.

Numerous inquiries regarding economic plants, heredity, plant-breeding and South America have been answered.

Miss Mary Ellen Peck, A.B. (Vassar College), was appointed Research Assistant beginning September 1, 1925. Miss Dorothy I. Neff completed her work toward an M.S. from Columbia University in June and entered the teaching profession in the fall of 1925.

Respectfully submitted,

ORLAND E. WHITE,
Curator of Plant Breeding
and Economic Plants.

REPORT OF THE HORTICULTURIST AND HEAD GARDENER FOR 1925

DR. C. STUART GAGER, DIRECTOR.

Sir: I beg to submit herewith my report for the year ending December 31, 1925.

The labor available for gardening operations was substantially the same as that of 1924. We are continually adding to the scientific collections and horticultural features of the Garden. Trees and shrubs planted during the past fifteen years are increasing in size with a corresponding increase in the amount of labor required for spraying, pruning, etc. This with the additional areas it is proposed to bring under cultivation in 1926 makes it highly desirable that the services of two more gardeners be provided.

In addition to routine maintenance, gardening work was as follows:

Rock Garden

In accordance with our plan to ultimately have none but alpine and saxatile plants in the rock garden, much of the material that was used as "filler," when the garden was first planted, was removed in the fall thus making room for planting more suitable material in the spring of 1926.

Bulb Planting

During the past five years over 140,000 bulbs have been planted in lawns and grassy areas throughout the Garden to give a naturalistic effect. In 1925 the number of bulbs planted amounted to over 31,000, distributed as follows:

6,000 Crocuses, yellow, blue, striped, and white—1,000 north of present planting, and 5,000 east of walk amongst Loniceras.
2,600 *Gladiolus* in variety, summer planting in border along west fence of experimental enclosure.
1,000 *Muscari azureum*, in grass north of Rock Garden.
1,000 *Muscari* "Heavenly Blue," in grass south of Rock Garden.
500 *Muscari elegans*, in grass amongst Viburnums.
2,000 *Narcissus incomp.* "Lucifer," from Boulder Hill pines, south to large button ball.

600 *Narcissus incomp.* "Stella," north of present planting of *Narcissus* "Sir Watkin" on west side of Boulder Hill.
1,000 *Narcissus odorus* "Orange Queen," on both sides of brook from Aralias to terminal pool.
2,000 *Narcissus* in variety, fall planting in border along west fence of experimental enclosure.
13,955 *Tulipa Gesneriana spathulata* (6,810) and *T. Gesneriana lutea* (7,145), on Robinia Hill.
500 *Chionodoxa Luciliae*, Rock Garden.
500 *Chionodoxa sardensis*, Rock Garden.
100 *Scilla bifolia*, Rock Garden.
100 *Tulipa australis*, Rock Garden.
100 *Tulipa Clusiana*, Rock Garden.
50 *Tulipa linifolia*, Rock Garden.

Miscellaneous Planting

During the year considerable progress was made in connection with the policy of clearly defining the limits of the Orders and Families of plants in the General Systematic Section (Section 1). Limiting hedges of *Syringa Emodi; Hibiscus syriacus* "Jeanne d'Arc"; *Cytisus scoparius;* and *Deutzia gracilis* were planted in connection with the Lilac, Linden, Pea, and Hydrangea families respectively, and soil preparation made for the installation of hedges on the south, and part of the east boundaries of the Rose family. In addition, the shrubs of the Rose, Hydrangea, Gooseberry, and Barberry families were rearranged, to segregate the genera, to facilitate study, and in some cases, to provide windbreaks or shade for less hardy subjects.

In order to secure a more effective grouping of species, practically the whole of the shrubs and trees on the Azalea Knoll were replanted in the spring. This was desirable because many of the species were mixed when received from the nurseryman. Advantage was taken of the opportunity afforded by this arrangement to improve the soil by the addition of sand, and to include several new genera in the collection.

The collection of outdoor Chrysanthemums, consisting of 330 plants in 19 varieties donated by the Charles H. Totty Company, was installed in one of the new beds in the Campanulales Order. As best results are secured by raising new plants annually, this

imposes an additional burden on our already overcrowded propagating houses.

In connection with the Beardless Iris Project, being carried out in cooperation with the American Iris Society, beds were prepared in the Experimental Enclosure and planted with Japanese and other irises. Also eight plots, each 10 x 12 feet, were prepared and planted with Japanese irises and experiments started with a view to learning more of the cultural requirements of this group. With the help of the laboring force, four new beds were added to those already along the brook, and planted with Japanese and bearded irises.

Other new planting included a bed for lily-of-the-valley near the border mound northwest of the esplanade, in which 3,000 "pips" were used.

Conservatories

The most important piece of work carried out in the conservatories was the thorough overhauling of the Economic House, for the purpose of providing room for the more important and interesting economic plants, and of making it more attractive to visitors. With this end in view many plants of lesser importance were discarded and new plants added, such as the chocolate tree, guttapercha, maté, the date palm, various citrus fruits, etc. So far as possible, flower pots were eliminated and the plants set directly in the beds. Surplus ornamental plants from the other greenhouses were planted as undergrowth and the walks defined with holly fern.

International Seed Exchange

The 1925 Exchange Seed List was restricted to woody plants and seeds of 282 species available for exchange were collected in the Garden and elsewhere. The distribution of seeds in 1925 to various countries is shown below:

Country	No. of Institutions	No. of Packets	Country	No. of Institutions	No. of Packets
Australia	1	16	Irish Free State	2	40
Austria	2	55	Italy	6	247
Bulgaria	1	63	Japan	1	15
Canada	2	163	Jugoslavia	2	97
Central Africa	1	49	Latvia	1	11
Czechoslovakia	3	144	Mexico	1	6
Denmark	1	40	Poland	2	133
England	3	74	Roumania	2	90
Esthonia	1	30	Russia	1	12
France	12	503	Scotland	1	53
Germany	11	327	Spain	1	126
Holland	2	45	Sweden	3	115
Hungary	1	91	Switzerland	5	134
India	2	137	United States	11	389
			Totals	82	3,205

Educational Work

In addition to several outside lectures, I conducted two courses for the general public at the Botanic Garden, namely, The Flower Garden, and Gardening in the Fall. Many questions relating to plant culture, soil preparation, the care of lawns, etc., have been answered orally or by letter.

Respectfully submitted,

MONTAGUE FREE,
Horticulturist and Head Gardener.

FINANCIAL STATEMENT FOR 1925

I. Tax Budget Accounts

1360 *Personal Service:*

Appropriation	$70,761.00	
Transferred from Code 1361, Lines 10, 11, 13 and 16	217.95	$70,978.95
Expended		70,978.95

1361 *Other Codes than Personal Service:*

Line 1 Fuel Supplies:

Appropriation	$ 3,200.00	
Transferred from Code 3222	2,190.00	$ 5,390.00
Expended		5,390.00

Line 2	Office Supplies:			
	Appropriation	$ 300.00		
	Transferred from Code 3222	100.00	$	400.00
	Expended			400.00
Line 3	Laundry, Cleaning and Disinfecting Supplies:			
	Appropriation		$	30.00
	Expended			30.00
Line 4	Botanical and Agricultural Supplies:			
	Appropriation		$	1,000.00
	Expended			1,000.00
Line 5	General Plant Supplies:			
	Appropriation		$	250.00
	Expended			250.00
Line 6	Wearing Apparel:			
	Appropriation		$	39.00
	Expended			39.00
Line 7	Office Equipment:			
	Appropriation		$	200.00
	Expended			200.00
Line 8	General Plant Equipment:			
	Appropriation		$	1,200.00
	Expended			1,200.00
Line 9	General Plant Material:			
	Appropriation	$ 1,100.00		
	Transferred from Code 3222	200.00	$	1,300.00
	Expended			1,300.00
Line 10	Repairs and Replacements:			
	Appropriation	$ 1,350.00		
	Transferred from Code 3222	1,000.00	$	2,350.00
	Expended	2,334.80		
	Transferred to Code 1360, Personal Service	15.20		2,350.00
Line 11	Light, Heat and Power:			
	Appropriation		$	500.00
	Expended	$ 379.55		
	Transferred to Code 1360, Personal Service	61.37		
	Transferred to Code 1361, Line 14, Telephone Service	59.08		500.00

Line 12	General Plant Service:		
	Appropriation		$ 500.00
	Expended		500.00
Line 13	Hire of Horses and Vehicles with Drivers:		
	Appropriation		$ 500.00
	Expended	$ 432.00	
	Transferred to Code 1360, Personal Service	68.00	500.00
Line 14	Telephone Service:		
	Appropriation	$ 275.00	
	Transferred from Line 11, Light, Heat and Power	59.08	$ 334.08
	Expended		334.08
Line 15	Carfares:		
	Appropriation		$ 50.00
	Expended		50.00
Line 16	Expressage and Deliveries:		
	Appropriation	$ 200.00	
	Transferred from Code 3222	200.00	$ 400.00
	Expended	326.38	
	Transferred to Code 1360, Personal Service	73.38	400.00
Line 17	Contingencies:		
	Appropriation		$ 100.00
	Expended		100.00
Summary of Tax Budget Accounts:			
	Appropriated	$81,555.00	
	Transferred, June 19, from Miscellaneous, New York County, Code 3222, N. Y. County Fund for Salary and Wage Accruals	3,690.00	$85,245.00
	Expended		85,245.00

II. Private Funds Accounts

1. *Endowment Fund* ($50,500.00) *Restricted in Part:*			
	Income Account:		
	Income 1925		$ 2,914.98
	Transferred to Endowment Increment Fund	$ 582.99	
	Transferred to Special Contributions	2,331.99	2,914.98
			$ 0.00

2. *Life Membership Fund* ($5,500.00) *Restricted:*

Income Account:		
Income 1925		$ 275.00
Expended	$ 119.33	
Transferred to Endowment Increment Fund	55.00	174.33
Balance, December 31, 1925		$ 100.67

3. *George C. Brackett Library Fund* ($500.00) *Restricted:*

Income Account:		
Balance, January 1, 1925		$ 26.45
Income 1925		27.48
		$ 53.93
Expended	$ 46.54	
Transferred to Endowment Increment Fund	5.49	52.03
Balance, December 31, 1925		$ 1.90

4. *Benjamin Stuart Gager Memorial Fund* ($13,417.20) *Restricted:*

Income Account:		
Balance, January 1, 1925		$ 156.35
Income 1925		737.92
		$ 894.27
Expended	$ 58.62	
Transferred to Endowment Increment Fund	147.58	206.20
Balance, December 31, 1925		$ 688.07

5. *Martha Woodward Stutzer Memorial Fund* ($5,000.00) *Restricted:*

Income Account:	
Income 1925	$ 275.00
Transferred to Endowment Increment Fund	55.00
Balance, December 31, 1925	$ 220.00

6. *Mary Bates Spalding Fund* ($1,697.00) *Restricted:*

Income Account:		
Balance, January 1, 1925		$ 135.63
Income 1925		93.32
		$ 228.95
Expended	$ 83.30	
Transferred to Endowment Increment Fund	18.67	101.97
Balance, December 31, 1925		$ 126.98

7. *Special Account W. Restricted:*

Income Account:		
Income 1925		$13,293.45
Expended	$ 265.86	
Transferred to Endowment Increment Fund	2,553.69	
Transferred to Special Contributions..	10,073.90	12,893.45
Balance, December 31, 1925		$ 400.00

8. *A. Augustus Healy Bequest* ($9,798.31) *Restricted:*

Income Account:		
Income 1925		$ 538.88
Transferred to Endowment Increment Fund	$ 107.77	
Transferred to Special Contributions..	431.00	538.77
Balance, December 31, 1925		$ .11

9. *R. B. Woodward Bequest* ($25,000.00) *Restricted:*

Income Account:		
Income 1925		$ 1,375.00
Transferred to Endowment Increment Fund	$ 275.00	
Transferred to Special Contributions..	1,100.00	1,375.00
		$ 0.00

10. *A. T. White Memorial Tablet Fund. Restricted:*

Income Account:		
Balance, January 1, 1925		$ 62.09
Income 1925		213.92
		$ 276.01
Expended	$ 25.00	
Transferred to Endowment Increment Fund	42.78	
Transferred to Special Contributions..	150.00	217.78
Balance, December 31, 1925		$ 58.23

11. *Brooklyn Institute Centennial Fund. B. B. G. Share.* ($30,000.) *Restricted:*

Income Account:		
Income 1925		$ 1,145.81
Transferred to Endowment Increment Fund	$ 229.16	
Transferred to Special Contributions..	916.65	1,145.81
		$ 0.00

12. *Sustaining Membership. Restricted:*

Received from dues 1925		$ 458.18
Expended		294.88
Balance, December 31, 1925		$ 163.30

13. *Annual Membership. Restricted:*

Received from dues 1925		$ 4,180.00
Deficit, January 1, 1925	$ 3,022.07	
Expended	2,983.60	6,005.67
Deficit, December 31, 1925		$ 1,825.67

14. *Tuition and Sales. Restricted:*

Balance, January 1, 1925		$ 1,170.25
Received, 1925:		
(*a*) Tuition	$ 1,422.00	
(*b*) Seed Packets	5,500.20	
(*c*) Incidentals	109.35	7,031.55
		$ 8,201.80
Expended	$ 7,055.44	
Transferred to Endowment Increment Fund	1,100.04	8,155.48
Balance, December 31, 1925		$ 46.32

15. *Botanic Garden Collection Fund, 1925. Restricted:*

Balance, January 1, 1925		$ 494.55
Received from Collections 1925		8,891.84
		$ 9,386.39
Expended	$ 6,020.64	
Transferred to Special Contributions	3,343.48	9,364.12
Balance, December 31, 1925		$ 22.27

16. *Special Fund* (*Brooklyn Institute General Endowment Income: Annual Allotment*). *Restricted:*

Income Account:		
Income 1925		$ 1,750.00
Transferred to Special Contributions		1,750.00
		$ 0.00

17. *Cary Library Fund* ($10,000.00—1/5 of Income to Brooklyn Botanic Garden). *Restricted:*

Balance, January 1, 1925		$ 42.61
Income Allotment 1925		110.00
		$ 152.61
Expended	$ 129.92	
Transferred to Endowment Increment Fund	22.00	151.92
Balance, December 31, 1925		$ .69

18. *Special Purposes. Restricted by terms of gifts:*

Balance, January 1, 1925		$ 79.42
Received:		
(*a*) Anonymous for Japanese Garden..	$ 500.00	
(*b*) Mr. Henry C. Folger for Shakespeare Garden	500.00	
(*c*) Various, for Test Garden for Japanese Iris	507.00	
(*d*) Miss Isabelle R. Reynolds for Memorial Tree	10.00	
(*e*) Mrs. Frederick W. Rowe for Lily-of-the-Valley Bed	50.00	
(*f*) Boys' and Girls' Club for Name Plates for Children's Garden Gate	7.50	
(*g*) Fence Repair Fund	250.00	
(*h*) Various, for Special Leaflet (Conservation of Beauty)	85.00	
(*i*) Anonymous for Subscription to Mrs. Walcott's "North American Wild Flowers"	500.00	
(*j*) Mr. Nathan Jonas, Contribution..	250.00	
(*k*) Anonymous, Special Gift for Children's Work	50.00	
(*l*) Anonymous, Contribution toward 1925 Deficit	1,000.00	
(*m*) Mrs. Frank Bailey for Spring Inspection	20.00	
(*n*) Flatbush Garden League for book.	1.25	
(*o*) Miss Ellen Eddy Shaw for book...	1.50	
(*p*) Various, (through Mrs. Glentworth R. Butler), for illustrative materials	17.20	3,749.45
		$ 3,828.87
Expended	$ 1,171.90	
Transferred to Special Contributions (with donor's consent)	1,000.00	2,171.90
Balance December 31, 1925		$ 1,656.97

19. *Plant Pathology Research Fund. Restricted:*

Balance, January 1, 1925	$ 207.86
Income 1925	12,203.29
	$12,411.15
Expended	8,987.61
Balance, December 31, 1925	$ 3,423.54

20. *Special Contributions (for 1925 only):*

Contributed		$ 214.51
Transferred from Endowment Fund Income Account.		2,331.99
Transferred from Special Account W. Income Acct...		10,073.90
Transferred from A. Augustus Healy Bequest Income Account		431.00
Transferred from R. B. Woodward Bequest Income Account		1,100.00
Transferred from A. T. White Memorial Tablet Fund Income Account		150.00
Transferred from Brooklyn Institute Centennial Fund Income Account		916.65
Transferred from Collections Fund		3,343.48
Transferred from Special Fund (Inst. Genl. End.)...		1,750.00
Transferred from Special Purposes		1,000.00
		$21,311.53
Deficit, January 1, 1925	$ 3,401.66	
Expended	20,155.08	23,556.74
Deficit, December 31, 1925		$ 2,245.21

21. *Endowment Increment Fund* ($26,162.42) *Restricted:*

Transferred from other accounts, 1925		$ 5,195.17
Interest 1925		1,174.69
		$ 6,369.86
For 1924 Deficit	$ 1,099.87	
Transferred to Principal	5,269.99	6,369.86
		$ 0.00

Summary of Private Funds Accounts:

Total Income	$63,029.48
Total Expenditures	60,191.31
Debit Balances:	
13. Annual Members	$ 1,825.67
20. Special Contributions	2,245.21
Total	$ 4,070.88
Credit Balances:	
Total	$ 6,909.05*

* *Note.*—Credit balances are on restricted funds from which transfers may not be made to accounts showing a deficit.

Respectfully submitted,
DANIEL C. DOWNS,
Secretary and Accountant.

APPROPRIATION OF REVENUE BONDS OF THE CITY OF NEW YORK FOR PERMANENT IMPROVEMENTS AND EXPENDITURES THEREFROM DURING 1925 [1]

R. D. P. 216-B, for Furnishing and Erecting Wrought Iron Picket Fence around Brooklyn Botanic Garden.

Appropriated		$40,000.00
Expended:		
Independent Wire Works	$13,284.00	
Engineer's Payroll	1,166.33	
E. G. Soltmann (Specifications and Prints)	25.50	14,475.83
Net Balance, December 31, 1925		$25,524.17

APPENDIX 1

GIFTS RECEIVED DURING 1925

Collections Fund

Miss E. Addie Austin
Mr. Frank Bailey
Mr. Frank L. Babbott
Dr. & Mrs. Glentworth R. Butler
Mr. Isaac M. Cary
Mr. W. S. Cole
Mrs. Alice C. Crowell
Mr. William C. Courtney
Mrs. John R. Delafield
Mrs. Coleman Dupont
Mr. Otto Ebel
Mr. Walter Ebel
Mr. Charles Ericson
Mr. Gates D. Fahnestock
Miss Elisabeth W. Frothingham
Mr. John W. Frothingham
Mr. O. C. Francis
Mr. W. M. Greve
Mr. & Mrs. W. E. Harman
Mrs. A. Augustus Healy
Mr. & Mrs. James M. Hills
Mr. A. W. Jenkins
Mrs. A. S. Kirkman
Miss Hilda Loines
Miss F. E. Longstreet
Mrs. Mary DeSilver Lord
Mr. William G. Low
Mr. James L. Morgan
Mr. Horace J. Morse
Mrs. Charles E. Perkins
Mr. George D. Pratt
Mr. Nathaniel W. Pratt
Mr. William A. Putnam
Mrs. William A. Putnam
Miss Lilian Sanger
Mr. F. H. Sloan
Mr. Harold Somers
Mrs. Mary Bates Spalding
Dr. Edward H. Squibb
Mrs. Seth Thayer Stewart
Mr. Herman Stutzer
Mrs. Herman Stutzer
Mrs. J. P. Warbasse
Mr. Edwin G. Warner
Miss Frances E. White
Mr. Harold T. White
Miss Harriet H. White
Mrs. Y. Willenbrock
Miss Mary Blackburne Woodward

[1] Data supplied by Department of Parks, Borough of Brooklyn.

Living Plants

Dr. Frank L. Babbott, Jr., 7 *Tulipa* from the Vale of Kashmir.
The E. T. Bedford Estate, 10 *Dahlia*.
Mr. Lorentz Cantor, 1 *Brasenia*.
Mr. Ernest F. Coe, 32 Dwarf Japanese plants (21 kinds); 1 Dwarf *Phlox subulata*.
Mr. C. N. W. Cumming, 21 Orchids.
Del-Bay Farms, Inc., through A. M. White, 6812 *Tulipa Gesneriana spathulata major*.
Doubleday, Page and Company (through Mr. Leonard Barron), 1 *Gordonia*.
Fairmount Park, Philadelphia, 12 *Gordonia*.
Mrs. M. C. Migel (through Miss B. Lutz), 2 *Lapageria*.
Mr. Harry Morris, 1 *Sarracenia*.
Miss Natalie Parrett, 1 potted plant of Tea.
O. M. Pudor, 9 English Hybrid Lupine.
Seabrook Company (now Del-Bay Farms, Inc.), 2500 Gladiolus, in 17 varieties.
Miss Ellen Eddy Shaw, 4 *Primula*.
Mr. Chas. H. Totty, 320 Chrysanthemum, in 19 varieties.
Andrew Wilson, Inc., 3 *Tillandsia*.
Miss Charlotte Young, 1 *Oxalis*, 2 *Sedum*.

Seeds

Dr. Frank L. Babbott, Jr. (1)
Dr. Barnum Brown (3)
Mr. Roscoe C. E. Brown (4)
Mrs. Glentworth R. Butler (1)
Mrs. E. L. Carson (1)
Mr. F. H. Gager (1)
Dr. A. H. Graves (1)
Mrs. Clarence R. Hyde (1)
Miss Hilda Loines (13)
Mr. Everett P. Martin (1)
Mrs. W. S. Peters (2)
Mr. A. L. Poessel (2)
Mr. O. M. Pudor (6)
Mr. Edward Richards (2)
Mrs. E. Root (1)
Mrs. Rothenburg (1)
Miss Grace Tabor (1)

Phanerogamic Herbarium

Dr. & Mrs. Glentworth R. Butler,
70 plants mentioned in the Bible, from Jerusalem.
Dr. H. M. Denslow,
1 *Conopholis* from Rockland County, New York.
Mr. W. C. Ferguson,
145 specimens from Long Island.
Miss Alice E. Fitts,
1 silver sword from Hawaiian Islands.
Miss Elsie M. Kittredge,
5 forms of frond of *Osmundia cinnamomea*.
Miss B. Lutz (through Dr. White),
50 plants from Brazil.

Mr. B. R. Massey,
6 oaks from Kingston, Marshall County, Oklahoma.
New York State Museum, Albany (through Dr. Homer D. House),
85 *Carex*.
Miss Ethel V. Woodward,
1 *Cupressus* collected by Miss Etta Simpson, California.

Cryptogamic Herbarium

Miss Mary Ingraham,
1 specimen of fleshy fungus (*Calvatia craniformis*).
Mr. George P. Moffat,
2 specimens of the "fossil alga" (*Cryptozoon proliferum* Hall).
Miss Margareth B. Reimer,
1 book of specimens of Marine Algae.

Iris Project

Special Fund

American Iris Society	$100
Mr. C. H. Hall	5
Mr. T. A. Havemeyer	25
Mr. Harlan P. Kelsey	5
Mr. William J. Matheson	200
Mrs. W. H. Peckham	52
Messrs. Stumpf & Walter	25
Mr. Louis C. Tiffany	75
Mr. Robert Wayman	20
	$507

Plants

J. K. Alexander, E. Bridgewater, Mass.	15	varieties
Bobbink & Atkins, Rutherford, N. J.	64	"
John Lewis Childs, Inc., Flowerfield, L. I.	82	"
The Elm City Nursery Co., New Haven, Conn.	10	"
Mrs. L. M. Hitchcock, New Rochelle, N. Y.	9	"
Dr. Nancy Jenison, New York City	16	"
Lovett's Nursery, Little Silver, N. J.	29	"
Mrs. C. S. McKinney, Madison, N. J.	6	"
Moon's Nurseries, Morrisville, Pa.	15	"
New York Botanical Garden, New York City	6	"
Mr. R. S. Sturtevant, Wellesley Hills, Mass.	2	"
Weed's Landscape Nursery, Beavertown, Oregon	53	"
Mr. John C. Wister, Germantown, Penna.	1	"

Library

(Exclusive of U. S. Government Documents)

Books

American Scenic and Historic Preservation Society, New York City	1
Miss Mildred E. Blood, Brooklyn, N. Y.	1
Dr. Glentworth R. Butler, Brooklyn, N. Y.	4
Miss Mary E. Butterick, Brooklyn, N. Y.	13
Carnegie Institution of Washington, Washington, D. C.	7
Mrs. John R. Delafield, New York City	11
Mr. H. C. Folger, Brooklyn, N. Y.	1
Mrs. Lewis W. Francis, Brooklyn, N. Y.	1
Mr. Montague Free, Brooklyn, N. Y.	1
Dr. C. Stuart Gager, Brooklyn, N. Y.	7
Miss Prudence Gager, Brooklyn, N. Y.	1
Mr. Joel Guthman, Brooklyn, N. Y.	1
Mr. Edward Hogg, Brooklyn, N. Y.	3
Mrs. Clarence R. Hyde, Brooklyn, N. Y.	10
Dr. Howard A. Kelly, Baltimore, Maryland	1
Mrs. Herbert Ketcham, Brooklyn, N. Y.	2
Mr. Joseph Lowe, Brooklyn, N. Y.	3
Mr. William W. Marshall, Brooklyn, N. Y.	3
Miss Jessie W. Post, Brooklyn, N. Y.	5
Miss Ellen Eddy Shaw, Brooklyn, N. Y.	1
Mr. Norman Taylor, Brooklyn, N. Y.	2
Mrs. Adrian Van Sinderen, Brooklyn, N. Y.	1
Total	80

Pamphlets

Prof. F. O. Bower, Glasgow, Scotland	10
Dr. William B. Brierley, Rothamsted, England	3
Dr. Glentworth R. Butler, Brooklyn, N. Y.	1
Carnegie Institution of Washington, Department of Genetics, Cold Spring Harbor, Long Island	5
Dr. W. T. Dudgeon and Dr. L. A. Kenoyer, Allahabad, India	1
Dr. O. A. Farwell, Detroit, Michigan	1
Federated Garden Clubs of New York State, New York City	1
Dr. Wladimir Finn, Kiew, Russia	1
Mr. Montague Free, Brooklyn, N. Y.	1
Dr. C. Stuart Gager, Brooklyn, N. Y.	83
Dr. Arthur H. Graves, Brooklyn, N. Y.	1
Mr. C. Norwood Hastie, Charleston, South Carolina	2
Mrs. Helen Smith Hill, Brooklyn, N. Y.	1
Dr. Arthur P. Kelley, New Brunswick, N. J.	1
Dr. T. A. Kiesselbach, Lincoln, Nebraska	4

Prof. Francis E. Lloyd, Montreal, Canada	2
Miss Hilda Loines, Brooklyn, N. Y.	1
Dr. Daniel McAlpine, Victoria, Australia	2
Ohio Botanic Garden Society, Cincinnati, Ohio	1
Dr. J. H. Priestley, Leeds, England	2
Dr. O. M. Pudor, Puyallup, Washington	1
Miss Madeline Reynolds, Cambridge, Mass.	1
Dr. Wilfrid Robinson, Manchester, England	3
Dr. Dezydery Sczymkiewicz, Warsaw, Poland	1
Miss Ellen Eddy Shaw, Brooklyn, N. Y.	1
Miss Ray Simpson, Brooklyn, N. Y.	1
Mr. Norman Taylor, Brooklyn, N. Y.	18
Dr. U. P. Van Ameyden, Semarang, Java	1
Mr. S. J. Wellensiek, Wageningen, Holland	1
Dr. Orland E. White, Brooklyn, N. Y.	1
Wisconsin University Library, Madison, Wisconsin	1
Total	154

PARTS OF PUBLICATIONS

Dr. Ralph C. Benedict, Brooklyn, N. Y.	2
Brooklyn Museum Library, Brooklyn, N. Y.	11
Mr. Montague Free, Brooklyn, N. Y.	13
Dr. C. Stuart Gager, Brooklyn, N. Y.	177
Garden Club of America, New York	1
Dr. Arthur H. Graves, Brooklyn, N. Y.	1
Dr. Alfred Gundersen, Brooklyn, N. Y.	1
Dr. Chancey Juday, Madison, Wisconsin	3
National Plant, Flower and Fruit Guild, New York	3
New York Academy of Sciences, New York City	28
New York City Department of Health, New York City	48
City Gardens Club, New York City	2
School Garden Association of New York, New York	11
Dr. Dezydery Sczymkiewicz, Warsaw, Poland	1
Miss Ellen Eddy Shaw, Brooklyn, N. Y.	1
Mrs. Annie Morrill Smith, Bronxville, N. Y.	3
Mr. Norman Taylor, Brooklyn, N. Y.	271
Miss Mabel Turner, North Reading, Mass.	21
The Misses White, Brooklyn, N. Y.	18
Miss Harriet H. White, Brooklyn, N. Y.	14
Dr. Orland E. White, Brooklyn, N. Y.	2
Wild Flower Preservation Society, Washington, D. C.	1
Wild Flower Preservation Society, Cincinnati Chapter, Cincinnati, O.	2
Woman's National Farm and Garden Association, New York, N. Y.	6
Total	641

PORTRAITS

Dr. Joseph Burtt Davy, Kew, Surrey, England	1
Dr. C. Stuart Gager, Brooklyn, N. Y.	1
Dr. Alfred Gundersen, Brooklyn, N. Y.	1
Prof. G. R. Lyman, Morgantown, West Virginia	1
Total	4

American Fern Society	$25
New York Association Biology Teachers	25
New York Bird and Tree Club	10
Torrey Botanical Club	25
Total	$85

FOR THE DEPARTMENT OF ELEMENTARY INSTRUCTION

American Manufacturing Company, One exhibit of Manila hemp and Java sisal for classroom use.

Beggs, Mr. Frank V., $4 to the children of the Brooklyn Botanic Garden.

Blum, Mrs. Edward C., One framed picture (Foxglove) for the children's garden house. Also, $3.60 for the purchase of pictures of wild flowers for the children.

Boys' and Girls' Club, $19 for one gate for the children's garden.

Brinsmade, Miss Alice, One fish globe and iron stand for children's garden house.

Butler, Dr. Glentworth R., $10 for children's garden library.

Butler, Mrs. Glentworth R., One prize cup to be competed for by the girls of the 1925 outdoor garden. Also, 1 olive wood box of assorted seeds, and fruits, and specimens of wood and of sackcloth from Jerusalem.

Butterick, Miss Mary, $25 for books for the children's garden library.

Cary, Mrs. William H., $2.40 for picture cards for use of the children in classrooms.

Corby, Mrs. George, $5 for the children's library.

Delafield, Mrs. John, $25 for the children's room.

Driggs, Miss Alice, 1 prize book for excellent work in the children's garden.

Flatbush Garden League (through Mrs. E. L. Carson), Prize books on gardening to be competed for in the outdoor garden.

Folger, Mr. Henry C., $500 for a Shakespeare garden, in the children's garden. (Presented through Mrs. Glentworth R. Butler.)

Francis, Mrs. Lewis W., $5 for the children's room. Also, $3.60 for pictures of wild flowers for classroom use.

Free, Mr. Montague, One book for the children's library.

Friedman, Mathilde, One large copper bowl for the children's room.

Gager, Prudence, One book for the children's library.

Garden Teacher's Association, Two prize cups competed for by boys of the outdoor garden.
Goodman, Bernard, $1 for the children's library.
Hammond, Elsie, One stuffed cat bird.
Hogg, Edward, $5 for books for the children's library.
Keiser, Mrs. J. C., $1 for books for the children's library.
Ketcham, Mrs. Herbert, $5 for books for the children's garden library.
Kierman, Mr. Frank, One model native Bolivian boat of gutta percha for classroom use.
Leech, Mrs. John E., $1 for slides for classroom use.
Leggett Company, J. Alexander, Two reels for classroom use.
Lowe, Mr. Joseph, $5 for books for the children's library.
Marshall, Mr. William W., $10 for books for the children's garden library.
Public School No. 36 (through Abraham London, Principal), Thirty bird houses made by the pupils.
Morse, Miss Alice, $3 for slides for classroom use.
Reed, Miss Mae, $5 for Special Fund of the Boys' and Girls' Club.
Richter, Susan K., Donation of plants for children's greenhouse.
Simpson, Miss Etta, Two photographs of gulls, and $5 for their framing for the children's room.
Shaw, Miss Ellen Eddy, Two gold honor pins for honorable service in the 1925 outdoor garden.
Underwood, Mr. John T., One Underwood typewriter, No. 5, for the Editorial Board of *Agricola* (Presented through Mrs. Glentworth R. Butler).
Van Sinderen, Mrs. Adrian, One book for the children's garden house. Also, a number of bronze Lafayette plates to be competed for by the children.
White, Miss Harriet H., $3.60 for pictures of ferns for classroom use.
Wilde, Miss Sylvia, $5 for pottery for children's garden house.

Miscellaneous

Anonymous.
$500 for subscription to "North American Wild Flowers," by Mrs. Charles D. Walcott.
Anonymous.
$500 for the Japanese Garden.
Anonymous.
One Dollar for the Botanic Garden Endowment Fund.
Mr. Frank Bailey.
$5,000 for the Botanic Garden permanent funds (Brooklyn Institute Centennial Fund).
Mrs. Frank Bailey.
$20 for flowers for Spring Inspection.
Mrs. E. G. Britton.
Colored post cards of wild flowers.
4 Seedlings of Holly.
1 Lantern slide.

Boys' and Girls' Club, Brooklyn Botanic Garden.

$7.50 for name plates on gifts to the Children's Garden.

$25 for the Botanic Garden Endowment Fund.

Editorial Board of *Agricola* (the paper published by the Boys' and Girls' Club).

$25 for the Botanic Garden Endowment Fund.

Miss Elisabeth W. Frothingham.

$1,000 to apply on Botanic Garden deficit.

Mr. Nathan S. Jonas.

$250 for Botanic Garden, Special Purpose.

Parmentier-Bayer Centenary Commission (Prof. Henry G. Bayer, Chairman, Exec. Comm.).

Bronze tablet in memory of André Parmentier.

Mrs. W. Sterling Peters.

2 flower vases; 1 green flower bowl; 1 crockery basket for flowers; 1 can of "Sparkote"; 1 oval hammered brass bowl; 1 deep copper jardiniere; 1 round-bottomed copper jardiniere, with standard; 2 shallow, circular, red and gray flower bowls; 1 ditto, green; 1 ribbed green flower bowl; 1 clear glass container for flowers; 1 tall green Egyptian vase with handles; 1 tall brown Egyptian vase with white design.

Mrs. James H. Post.

$250 for the purchase of bulbs.

Miss Maude L. Purdy.

$5 for the Botanic Garden Endowment Fund.

Miss Isabelle R. Reynolds.

$10 for a tree.

Mrs. Frederick W. Rowe.

$50 for a bed of Lily-of-the-Valley.

Woman's Auxiliary, Brooklyn Botanic Garden.

$12.75 toward expenses of the Spring Inspection.

Articles purchased for the Annual Spring Inspection, as follows: 2 Refectory tables, $130, and cartage of same, $4; 12-gallon hot water urn, $78; 10 Canton teapots, $35; 18 dozen cups, $45; 2 large aluminum pitchers, $7.50; 12 cream pitchers, $3.60; 1 dozen papier mache trays, $8.55; 18 small forks, $1.80; 4 brass bowls at $2.75 each, $11; 4 blue plates, $1.00; 1 brass tray, $3.50; total value of gifts, $328.95.

APPENDIX 2

PUBLICATIONS OF MEMBERS OF STAFF DURING 1925

Benedict, Ralph C.

—— The Conservation of Beauty. *Brooklyn Bot. Gard. Leaflets* **XIII**[5–6]. June 10.

Faris, James A., and George M. Reed

—— Modes of infection of sorghums by loose kernel smut. *Mycologia* **17**: 51–67. March–April. (*Brooklyn Bot. Gard. Contrib.* No. 44.)

Free, Montague

—— Flower Favorites. *Natl. Plant, Flower and Fruit Guild Mag.* January.

—— Fourteenth Annual Report of the Brooklyn Botanic Garden. Report of the Horticulturist. *Brooklyn Bot. Gard. Rec.* **14**: 54–58. April.

—— Summer-Hyacinth. *Gard. Chron. Amer.* **29**: 1. January.

Gager, C. Stuart

—— Fourteenth Annual Report of the Brooklyn Botanic Garden, 1924. Report of the Director. *Brooklyn Bot. Gard. Rec.* **14**: 21–38. April.

—— Brooklyn Botanic Garden Gives Great Civic Service. *Brooklyn* (Official publication of Brooklyn Chamber of Commerce). **6**: 3, 4, and 12. Aug. 8. (Reprinted as a Botanic Garden pamphlet.)

—— The Relation between Science and Theology. How to think about it. Pp. 100. Chicago, Open Court Publishing Co. October.

—— Contribution of a Botanic Garden to Popular Education. *School Life* (Bureau of Education, Washington). **11**: 32–33. Oct.

Graves, Arthur Harmount

—— Report of the Curator of Public Instruction for 1924. *Brooklyn Bot. Gard. Rec.* **14**: 60–64. April.

—— A preliminary list of native and naturalized woody plants of Greater New York. *Brooklyn Bot. Gard. Leaflets* **XIII**[7–9]. October 14.

—— 84 newspaper articles written during the course of the year on matters relating to the Brooklyn Botanic Garden.

—— 13 abstracts of botanical books and pamphlets in Botanical Education section of Botanical Abstracts, Vol. 14.

Gundersen, Alfred

—— Seed List. *Brooklyn Bot. Gard. Rec.* **14**: Jan. (with Mr. Free).

—— International Seed Exchange, Communication No. 5, April (with C. Stuart Gager).

—— Some Questions Relating to the Classification of Flowering Plants. *Brooklyn Bot. Gard. Leaflets* **XIII**[10]. Oct. 28.

—— International Seed Exchange, Communication No. **6**, November (with C. Stuart Gager).

—— Is an International List of Genera of Cultivated Plants Possible? *Science* **62**: 589. Dec. 25.

Neff, Dorothy I.

—— Eleven abstracts of scientific papers relating to heredity, plant breeding, and evolution. *Botanical Abstracts* (Genetics Section). Vol. XIV.

Reed, George M.

—— Sorghum. *Brooklyn Bot. Gard. Leaflets* **XIII**[1–3]. April.

—— The test garden for Apogon irises. *Amer. Iris Soc. Bull.* **15**: 22–24. April.

—— The test garden for beardless irises. *Brooklyn Bot. Gard. Rec.* **14**: 115–118. July.

—— The inheritance of resistance of oat hybrids to loose smut. *Mycologia* **17**: 163–181. July–Aug. (*Brooklyn Bot. Gard. Contrib.* No. 45.)

Reed, George M., Marion Griffiths, and F. N. Briggs

—— Varietal susceptibility of oats to loose and covered smuts. *U. S. Dept. Agr. Bull.* 1275: 1–39. April. (*Brooklyn Bot. Gard. Contrib.* No. 34.)

Reed, George M., and L. E. Melchers

—— Sorghum smuts and varietal resistance in sorghums. *U. S. Dept. Agr. Bull.* 1284: 1–56. August. (*Brooklyn Bot. Gard. Contrib.* No. 33.)

Reed, George M., and T. R. Stanton

—— Relative susceptibility of selections from a Fulghum-Swedish Select cross to the smuts of oats. *Journ. Agr. Res.* **30**: 375–391. February. (*Brooklyn Bot. Gard. Contrib.* No. 39.)

Shaw, Ellen Eddy

—— New Years greeting. *Natl. Plant, Flower and Fruit Guild Mag.* **14**: 10. Jan.

—— Peter's little greenhouse. *Junior Home Mag.* **6**: 10. Feb.

—— Spring acquaintances. *Junior Home Mag.* **6**: 10. April.

—— What life has taught me. Woman's Page, *Brooklyn Daily Eagle.* April.

—— Twelfth annual garden exhibit for Brooklyn boys and girls. *Brooklyn Bot. Gard. Leaflets* **XIII**[4]. May 13.

—— Keep your eyes open. *Junior Home Mag.* **6**: 10. June.

—— Now my idea is this: Opportunities for children at the Brooklyn Botanic Garden. *New York Evening Post.* June.

—— Work for boys and girls at the Brooklyn Botanic Garden. *Brooklyn Citizen.* June.

—— Cooperation between a Botanic Garden and Local City Schools. *School Life.* June.

—— My fishing pole—The story of bamboo. *Junior Home Mag.* **6**: 10. Aug.

—— Rubber, rubber—where did my ball come from? *Junior Home Mag.* **6**: 10. Oct.

—— Garden activities of South Brooklyn Public Schools at the Brooklyn Botanic Garden. *The Item.* Oct.

Simpson, Ray

—— Report of the Librarian for 1924. *Brooklyn Bot. Gard. Rec.* **14**: 71–76. April.

—— Garden books. *Natl. Plant, Flower and Fruit Guild Mag.* **14**: 6–7. June.

Taylor, N.

—— House's List of New York State Plants. *Torreya* **25**: 13–15. January.

—— Supplement to author's Botany, the Science of Plant Life. P. F. Collier & Son Company. January.

—— Berry's Tree Ancestors. (Review) *Saturday Review.* February.

—— Report of the Curator of Plants and Plantations for 1924. *Brooklyn Bot. Gard. Rec.* **14**: 91. April.

—— Fabre's Wonder Book of Plant Life. (Review) *Saturday Review.* August.

—— Three little tree books. *Saturday Review.* October.

—— Kingdon Ward's From China to Hkamti Long. (Review) *Saturday Review.* November.

White, Orland E.

—— Report of the Curator of Plant Breeding and Economic Plants for 1924. *Brooklyn Bot. Gard. Rec.* **14**: 53–54. April.

—— Inheritance studies in Pisum. V. The inheritance of scimitar pod. *Genetics* **10**: 197–210. May. (*Brooklyn Bot. Gard. Contrib.* No. 43.)

—— A leaf color seedling variation in Duguetia. *Jour. Heredity* **16**: 381–382. October.

—— Geographical distribution and the cold-resisting character of certain herbaceous perennial and woody plant groups. *Brooklyn Bot. Gard. Rec.* **15**: 1–10. January 1926. (Actual month of publication Dec. 1925.)

—— Fifteen abstracts of scientific papers and books relating to heredity, plant breeding, and evolution. *Botanical Abstracts* (Genetics Section). Vol. XIV.

White, Orland E., and Dorothy I. Neff

—— Investigations on the laws of heredity and variation in plants. Genetics and Plant Breeding. Reports on Research for 1924. *Brooklyn Bot. Gard. Rec.* **14**: 43–44. April.

APPENDIX 3

TALKS, PUBLIC LECTURES, ADDRESSES, AND PAPERS GIVEN BY MEMBERS OF STAFF DURING 1925

By the Director of the Garden:

March 17. *The Japanese Iris project at the Brooklyn Botanic Garden.* N. Y. State Federation of Garden Clubs. Hotel Roosevelt.

March 28. *The educational work of the Brooklyn Botanic Garden.* Field work class from Teachers' College, Columbia Univ. At the Garden.

March 31. *The Brooklyn Botanic Garden.* Broadcast Talk from Station WJY (Radio Corporation of America).

May 29. *Activities of the Brooklyn Botanic Garden.* Library School of the New York Public Library. At the Garden.

July 11. *How to think about evolution.* N. Y. Botanical Garden, Bronx Park.

July 18. *How to interpret a Japanese Garden.* Before the League of Neighbors and the Union of East and West. Brooklyn Botanic Garden.

Oct. 5. *The relation between science and religion.* Men's "200" Club, 12th St. Reformed Church, Brooklyn.

Oct. 17. André Parmentier. Address in accepting, on behalf of the Brooklyn Botanic Garden, a bronze tablet commemorating the horticultural work of André Parmentier, and presented by the Parmentier-Bayer Centenary Commission on Oct. 17, 1925. At the Botanic Garden.

Oct. 23. *The significance of the Scopes trial for teachers of science.* New York State Teachers' Assoc., Southeastern District, Science Section. Teachers' College, Columbia University.

Nov. 20. *Conservation Progress at Brooklyn Botanic Garden and elsewhere during 1925.* New York Bird and Tree Club. Hotel Roosevelt.

By the Curator of Public Instruction:

February 3. *Conservation.* City Garden Club, Manhattan.

March 20. *The trees and shrubs on the school campus.* Junior Scientific Society, Flushing High School.

April 3. *Forestry in the United States.* Bay Ridge High School. Arbor Day Celebration.

April 21. *Conservation and forestry.* Combined Arbor and Bird Day Celebration, Flushing High School.

April 22. *The development and work of the Brooklyn Botanic Garden.* Flatbush School, Mothers' Club.

April 28. *Forestry for Boy Scouts.* Scout Masters' Group, American Museum of Natural History.

May 12. *How the tree grows and forms wood.* Public School 64, Brooklyn.

October 20. *The study of trees.* Under the auspices of the School Garden Association of New York, American Museum of Natural History.

December 11. *Plants at the exhibit of the School Nature League.* Public School 65, Manhattan.

By the Curator of Elementary Instruction:

February 4. *The care of house plants.* Garden Club, Elizabeth, New Jersey.

February 14. *Banquet address.* P. S. No. 24 teachers and ex-teachers. Hotel St. George.

February 19. *Plants that take care of us and give us a good time.* Birch-Wathen School, New York.

March 4. *Garden and nature work in relation to the child's development.* The Federation for Child Study, New York.

March 10. *A demonstration school garden.* School Garden Association. American Museum of Natural History.

March 17. *Signs of spring.* P. S. No. 165.

March 18. *Spring at the Brooklyn Botanic Garden.* Mothers' Club, P. S. No. 42, at the Garden.

March 27. *The work of the Brooklyn Botanic Garden.* Mother and Daughter Dinner, Flatbush Presbyterian Church.

April 3. *Children's gardening.* P. S. 41, Queens, Bayside, Long Island.

April 6. *The children's work at the Brooklyn Botanic Garden.* Brooklyn Woman's Club.

April 7. *The work of the Brooklyn Botanic Garden.* Central Congregational Church.

April 7. *Spring gardens.* Mothers' Clubs of the C. W. Bliss and Bethany Kindergartens.
April 13. *Backyard gardens.* The Garden Association. Newport, R. I.
April 15. *Soils.* Garden Club, Elizabeth, New Jersey.
April 20. *Children's gardens.* WNYC Broadcasting Station.
April 22. *Spring and spring gardens.* Daughters of the Revolution, Ramapo Valley Chapter, Ridgewood, N. J.
April 23. *Children's gardens.* City Gardens Club.
April 23. *Garden Steps.* WNYC Broadcasting Station.
April 28. *Spring gardens.* Garden Club of Crestwood. Crestwood, New York.
April 29. *Children's gardens.* Grace Church Kindergarten.
May 4. *Planting a small vegetable garden.* WNYC Broadcasting Station.
May 13. *The work of the Brooklyn Botanic Garden.* Heads of Department Association of Brooklyn. At the Garden.
May 14. *Children's activities at the Brooklyn Botanic Garden.* Public School Kindergarten Association, Brooklyn Branch. At the Garden.
May 18. *Useful plants of South America.* Birch-Wathen School, New York.
May 18. *Your garden.* WNYC Broadcasting Station.
May 19. *Gardening.* Erasmus Hall High School Annex.
May 19. *The work of the Brooklyn Botanic Garden.* Mothers' Club, P. S. No. 134. At the Garden.
May 20. *Opportunities for boys and girls at the Brooklyn Botanic Garden.* Crestwood School, Crestwood, New York.
May 22. *Spring and nature.* P. S. No. 5.
May 25. *Summer care of the garden.* WNYC Broadcasting Station.
June 2. *Children's activities at the Brooklyn Botanic Garden.* Mothers' Club, Lewis Avenue Congregational Church. At the Garden.
September 18. *Address at presentation of garden prizes.* P. S. No. 41, Queens.
October 6. *Bulbs and house plants.* Mothers' Club, P. S. No. 20.

October 9. *My visit to Goldsmith College.* A talk to the junior class at Maxwell Training School for Teachers.
October 15. *Observing nature week.* Assembly, P. S. No. 66.
October 16. *Nature experiments for little children.* Mothers' Club, Parkside School.
October 22. *Nature talk.* P. S. No. 185.
October 26. *Nature talk with pictures.* P. S. No. 185.
October 27. *Bulbs and house plants.* Mothers' Club, P. S. No. 154.
November 9. *Children's activities at the Brooklyn Botanic Garden.* Brooklyn Heights Seminary Alumnae Association.
November 11. *Indoor gardening.* Woman's Alliance, Fourth Unitarian Church.
November 24. *Children's activities at the Brooklyn Botanic Garden.* Central Congregational Church.
December 3. *Bulbs.* Birch-Wathen School, New York.
December 3. *The Shakespeare Garden at the Brooklyn Botanic Garden.* Society of Old Brooklynites.
December 10. *Christmas greens.* Birch-Wathen School, New York.
December 24. *Christmas spirit.* P. S. No. 36.
December 29. *Nature study in camp life.* Camp Kokosing. At the Hotel St. George.

By the Assistant Curator of Elementary Instruction:

June 12. *Some plants and their habits.* P. S. No. 129.
October 5. *Winter Nature Study—things of use to the kindergarten during the winter season.* Free Kindergarten Teachers.
December 18. *The trees of Bushwick Park.* P. S. No. 123.

By Instructors:

January 9. *What the Brooklyn Botanic Garden offers to Brooklyn children.* P. S. 122, Miss Turner.
January 26. *What nature study means in the life of a child.* Parents' Association, P. S. 41, Miss Turner.
March 4. *The home garden.* Woman's Club of Wyckoff, New Jersey, Miss Turner.

By the Curator of Plant Pathology:

March 20. *Cereal Food Production.* The New York City Biology Teachers' Association, Washington Irving High School.

By the Curator of Plant Breeding and Economic Plants:

March 24. *Economic plants of the tropics.* Public School Teachers. At the Garden.

March 28. *Economic plants of the tropics.* Graduate Class in Biology, Teachers' College. At the Garden.

April 5. *Adventures of a plant hunter in the South American tropics.* Graduate Club, Teachers' College, Columbia University.

April 9. *Economic plants of South America.* Senior Biology Class, Miss Beard's School, East Orange, N. J. At the Garden.

June 5. *Plant breeding and heredity.* Biology Class, Manual Training High School. At the Garden.

October 15. *The ways of plants.* Biology Class, Girls' Commercial High School. At the Garden.

October 16. *Plant relations.* Biology Class, Girls' Commercial High School. At the Garden.

October 27. *Economic plants of South America.* Maxwell Training School for Teachers, Brooklyn.

October 27. *What foods we owe to South America.* Geography Class, Maxwell Training School for Teachers, Brooklyn.

November 20. *Bolivian wilderness and city.* Public lecture, Burr and Burton Seminary, Manchester, Vermont.

December 21. *Economic plants of the tropics.* Biology Class, Hunter College. At the Garden.

December 22. *Economic plants, especially of South America.* Biology Class, Hunter College. At the Garden.

By the Resident Investigator:

April 14. *Conservation of beauty.* Science Club, Hunter College, New York.

April 15. *Biology and religion.* Flatbush Congregational Church, Brooklyn, N. Y.

April 22. *Conservation of beauty.* Science Club, Hunter College, New York.

May 31. *Biology and religion.* All Souls Universalist Church, New York.

June 3. *Natural history of the Hudson River.* High School, New York.

October 29. *Evolution as illustrated by ferns.* Biology Club of the City of New York, New York.

By the Curator of Plants and Plantations:

April 20. *City Gardens.* Clinton Avenue Association.

April 20. *Flower color.* Garden Club of Somerset Hills.

April 22. *Flower color.* Plainfield Garden Club.

August 18. *Flower color.* South Shore Garden Club, Narragansett.

By the Curator of Plants:

April 29. *Shrubs of the Four Seasons.* Elizabeth Garden Club, Elizabeth, N. J.

By the Horticulturist:

January 22. *Rock Gardens.* Ridgewood Garden Club, Ridgewood, New Jersey.

July 16. *Rock Gardens.* Lake George Garden Club, Lake George, New York.

September 30. *Rock Gardens.* North Country Club, Cold Spring Harbor, Long Island.

November 9. *Rock Gardens.* New Canaan Garden Club, New Canaan.

November 30. *English Gardens.* Brooklyn Art Guild, Brooklyn Botanic Garden.

By the Librarian:

May 29. *The organization and work of the Brooklyn Botanic Garden library.* Junior Class, Library School of the New York Public Library, annual visit at the Garden.

By the Registrar and Custodian:

March 7. *Tramp signs.* Woodcraft League "Brownies." Brooklyn Botanic Garden.

October 4. *Life story of the honeybee.* Inkowa Club. Brooklyn Botanic Garden.

October 20. *The use and beauty of American trees.* Department of Botany, Brooklyn Institute of Arts and Sciences. Brooklyn Botanic Garden.

APPENDIX 4

REPORT ON BROOKLYN BOTANIC GARDEN PUBLICATIONS, 1925

American Journal of Botany.—Official publication of the Botanical Society of America, and published in cooperation with the Society. Monthly, except August and September. The ten issues for 1925 constitute Volume XII, with 50 articles on various phases of botany, 667 pages (an increase of 11 pages over last year), 62 plates and 142 text-figures. The circulation, as of November 31 (the close of the fiscal year of the *Journal*), was 1,297. Prof. C. E. Allen, University of Wisconsin, continued as editor-in-chief, with an editorial board of eight, of which the business manager (the director of the Garden) and one of the editors (at present, Dr. Arthur Harmount Graves) are appointed by the Botanic Garden. One editor is elected by the American Phytopathological Society, and the others by the Botanical Society of America.

Ecology.—Official publication of the Ecological Society of America. Quarterly. The editorial board is elected by the Ecological Society, with the exception of the business manager (the director of the Botanic Garden) and one editor (at present, Mr. Norman Taylor), who are appointed by the Botanic Garden. Volume VI, 1925, contains 35 original papers, besides notes and comment, reviews, and abstracts of current ecological literature, and proceedings of the annual meeting of the Society. There were 473 pages, with 5 plates and 78 text-figures.

Genetics.—Published bi-monthly in cooperation with the Editorial Board of *Genetics;* Prof. George H. Shull, Princeton University, managing editor. This journal is a periodical record of investigations bearing on heredity and variation in both plants and animals. The director of the Botanic Garden is business

manager. During 1925 there have been published one issue of Volume 9 (November, 1924), and four issues of Volume 10 (January–July, 1925), containing, in all, 28 articles, 516 pages, 6 plates, and 118 text-figures.

Record.—Administrative quarterly. The October issue contains the annual *Prospectus* of the educational work of the Garden, the April number comprises the *Annual Report* of the Garden, and the January issue (beginning with 1925) comprises the annual *List of Seeds* offered in exchange with other botanic gardens. The October number is reserved for miscellaneous administrative matters. The RECORD is sent free to all Botanic Garden members. Volume XIV, 1925, contains 147 pages and 11 half-tone illustrations.

Contributions.—Numbers 33, 34, 39, 43, 44, and 45 were published during the year. Each number is a paper reprinted from the original place of publication.

Leaflets.—Series XIII comprised 10 numbers, of which Nos. 1–6 appeared during April–June and Nos. 7–10 in October. This publication is sent free to members of the Garden and, on request, to teachers in the city schools.

Seed List.—This was a separate publication for the first ten years (1914–1923). Beginning with the list of 1924 collections it was published in the January issue of the Brooklyn Botanic Garden RECORD, appearing for the first time in the RECORD for January, 1925.

Research Papers.—The total number of pages of research papers by members of staff and others published during 1925 (including the first three journals above mentioned) was 1,824 as against 1,683 in 1924, and 1,741 in 1923.

APPENDIX 5

MEETINGS OF ORGANIZATIONS AT THE GARDEN, 1925

March 5. Garden Teachers' Association.
March 7. Woodcraft League "Brownies."
March 18. Mothers' Club, P. S. 42.
March 28. Columbia University (Class in Horticulture).
May 13. Heads of Department Association.
May 14. Free Kindergarten Association (Brooklyn).
May 19. Mothers' Club, P. S. 19.
May 23. New York Regional Catalogue Group.
May 29. Library School, New York Public Library.
June 2. Mothers' Club, Lewis Ave. Congregational Church.
June 12. New Rochelle Garden Club.
June 21. Italian Young Folks' League of America.
July 18. League of Neighbors, and Union of East and West.
October 4. Inkowa Club.
October 20. Department of Botany, Brooklyn Institute.
October 23. Mothers' Club, P. S. 41, Queens.
November 20. Girl Scouts and Captains.
November 30. Brooklyn Art Guild.
December 11. Girl Scouts.

APPENDIX 6

FIELD TRIPS

By the Director:

May 16. Torrey Botanical Club. Brooklyn Botanic Garden.

By the Curator of Public Instruction:

July 31 to Aug. 3. Torrey Botanical Club. Northeastern Catskill Mountains. (With Dr. Alfred Gundersen.)
August 23. Torrey Botanical Club. Kensico Reservoir, White Plains, N. Y.

By the Curator of Plants and Plantations:

September 27. Torrey Botanical Club. Merrick.

By the Curator of Plants:

July 5. Torrey Botanical Club to Palisades.
July 31 to Aug. 3. Torrey Botanical Club to northeastern Catskill Mountains.

By the Registrar and Custodian:

June 20. Nassau County Council, Training School for Scoutmasters. Wheatley Hills, Long Island.
July 3–5. Pioneer Youth Camp. Pawling, N. Y.
July 11. New Jersey State Y. M. C. A., "Wawayanda." Andover, New Jersey.
July 18. Brooklyn Boy Scouts, "Camp Ramapo." Oakland, New Jersey.
July 19. Montclair Scout Camp, "Glen Gray." Oakland, New Jersey.
August 29. Brooklyn Scout Camps. Kanohwahke Lakes, New York.
October 4. Inkowa Club. Brooklyn Botanic Garden.
October 17. Boy Scouts. Bound Brook, New Jersey.

APPENDIX 7

REPORT ON PHOTOGRAPHIC WORK, 1925

Negatives on file December 31, 1924		5,225
Negatives accessioned during 1925		495
Total negatives on file December 31, 1925		5,720
Lantern slides on file December 31, 1924		4,265
Lantern slides accessioned during 1925		157
Total lantern slides on file December 31, 1925		4,422
Prints on file December 31, 1924		1,551
Prints made during 1925	1,793	
Used or distributed	1,298	
Filed	495	
Total prints on file December 31, 1925		2,046
Enlargements made		50

APPENDIX 8

EDUCATIONAL INSTITUTIONS AND OTHER ORGANIZATIONS WITH WHICH THE BROOKLYN BOTANIC GARDEN HAS COOPERATED DURING 1925

Municipal Departments and Institutions

College of the City of New York (Manhattan).
Department of Education, New York City.
  Brooklyn Model School.
  Continuation School, Brooklyn.
  Director of School Gardens.
  High Schools and Annexes:
    Brooklyn (14 or 93%), Manhattan (8 or 80%),
    Queens (3 or 50%), Richmond (1 or 100%),
    Bronx (1 or 25%),
  Junior High Schools, { Brooklyn (5 or 33%), Manhattan (1).
  Jamaica Training School for Teachers.
  Maxwell Training School for Teachers (Brooklyn).
  New York Training School for Teachers (Manhattan).
  Opportunity School for Boys (P. S. 90), Brooklyn.
  Public Schools:
    Brooklyn (175 or 94%), Queens (10), Bronx (4),
    Manhattan (10), Richmond (1).
Department of Health.
Department of Parks:
  Brooklyn, Manhattan, Queens.
Hunter College (Manhattan).

Total departments, 5. Total institutions, 247.

Other Free Public Institutions, New York City

Manhattan:

  American Museum of Natural History.
  Metropolitan Museum of Art.
  Museum of the American Indian, Heye Foundation.
  New York Public Library:
    Library School.

Brooklyn:

  Brooklyn Museum.
  Brooklyn Public Library.
  Children's Museum.
  Long Island Historical Society Library.

Bronx:

New York Botanical Garden,
New York Zoological Park.

Richmond:

New York Public Library, Tottenville Branch,
Public Museum, New Brighton.

Total institutions, 12.

Other Institutions and Organizations in Greater New York

Adelphi College.
American Geographical Society.
Birch-Wathen School.
Boy Scouts.
Brooklyn Art Guild.
Brooklyn Chamber of Commerce.
Brooklyn Children's Aid Society.
Brooklyn Heights Seminary Alumnae Association.
Brooklyn Home for Aged Men and Aged Couples.
Brooklyn Home for Children.
Brooklyn Institute Department of Botany.
Brooklyn Teachers' Association.
Brooklyn Training School for Girls.
Brooklyn Woman's Club.
Campfire Girls.
Child Study Association of America, Inc.
Churches in Brooklyn (8).
City Gardens Club.
Clinton Avenue Association.
Columbia University:
  Barnard College.
  Columbia College.
  Teachers College.
Congregational Home for the Aged.
Daughters of the Revolution.
Federation for Child Study (New York).
Flatbush School.
Free Kindergarten Association (Brooklyn).
Froebel League (Manhattan).
Girl Scouts.
Hall of Fame.
Heads of Department Association (Public Schools, Brooklyn).
Inkowa Club.
Institute for Public Service.
Italian Young Folks' League of America.
League of Neighbors.
Merchants' Associations (Manhattan).

Mothers' Clubs (8).
Miss Kirk's School.
Museum of the American Indian, Heye Foundation.
National Kindergarten Association.
National Plant, Flower and Fruit Guild.
New York Academy of Sciences.
New York Bird and Tree Club.
New York Association of Biology Teachers.
New York Horticultural Society.
New York Regional Group of Cataloguers.
New York University.
Norwegian Hospital.
Orphan Asylum, Sterling Place (Brooklyn).
Packer Collegiate Institute.
Parochial Schools, Brooklyn (5).
Private Elementary Schools, Brooklyn (9).
Prospect Heights Hospital & Brooklyn Maternity.
Public School Kindergarten Association (Manhattan).
Rockefeller Institute for Medical Research.
St. Christopher's Hospital for Babies.
St. Giles' Hospital for Crippled Children.
School Art League.
School Garden Association of New York.
School Nature League.
Shore Road Academy.
Society of Old Brooklynites.
Torrey Botanical Club.
Union of East and West.
U. S. Rubber Company Library.
Woodcraft League.

Total institutions, 93.

Institutions Outside of New York City

Domestic:

American Fern Society.
American Iris Society.
Biological Laboratory, Cold Spring Harbor, L. I.
Botanic Gardens, Seed Exchange (5).
Botanical Abstracts.
Botanical Society of America.
Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y.
Boys' Camps (5).
Burr and Burton Seminary, Manchester, Vt.
California Botanical Foundation (Los Angeles).
Carnegie Institution of Washington.
Carnegie Library, Pittsburgh.
Cluj (Roumania) Grădina Botanica.

Connecticut Agricultural Experiment Station, New Haven.
Connecticut College.
Connecticut Forestry Association.
Crestwood School (Crestwood, N. Y.).
Daughters of the Revolution (Ridgewood, N. J.).
Ecological Society of America.
Eddy Tree Breeding Institute (California).
Erie (Pa.) Public Library.
Fairmount Park (Philadelphia).
Garden Clubs (11).
General Federation of Women's Clubs (Washington, D. C.).
Genetics (Bi-monthly Journal), Editorial Board of.
Harvard University.
Indiana University.
John Burroughs Memorial Association.
Joliet (Ill.) Botanic Garden and Arboretum.
Joplin (Missouri) Park Department.
Merchants' Association, Manhattan.
Michigan State Teachers' Association.
Miss Beard's School (East Orange, N. J.).
National Association of Gardeners.
National Commission of the Fine Arts, Washington, D. C. (Re National Botanical Garden and Arboretum.)
National Council of Nature Supervisors and Teachers.
National Nature Study Association.
National School Garden Association.
New York State Federation of Garden Clubs.
New York State Forestry Commission.
New York State Museum.
New York State Teachers' Association (Science Section).
Northern Nut Growers' Association.
Rutgers University.
Smith College.
State Normal School, Lowell, Mass.
State University of Iowa.
Syracuse University (Library).
University of Michigan.
University of Minnesota, Department of Agriculture.
University of Montana, Department of Botany.
University of Pennsylvania.
University of the State of New York.
U. S. Bureau of Education.
U. S. Department of Agriculture.
U. S. National Museum (Herbarium).
Wildflower Preservation Society of America.
Woman's National Farm and Garden Association.

Yale University.
Total institutions, 77.

Foreign:

Botanic Gardens, Seed Exchange (82 Gardens).
Canton Christian College.
L'Institut National d'Agronomique (Paris).
School Nature Study Union (England).
Total institutions, 85.

Miscellaneous Institutions and Organizations, Exchange of Publications, 327.
Grand Total of Institutions and Organizations, 840.

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[2] Deceased June 11, 1925.

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*Lord, Mrs. John Bradley
Low, Mrs. A. A.
McMahon, Jos. T.
MacDonald, Mrs. Ian
Maxwell, J. Rogers, Jr.
Morse, Horace J.
Oakley, Mrs. Theodora L.
Olcott, George M.
*Palmer, Lowell M.
Peabody, George Foster
*Pell, Rev. Alfred Duane
Pell, Mrs. Cornelia L.
Post, James H.
Powell, Mrs. Robert L.
Pratt, George D.
Putnam, Wm. A.
*Sanger, William Cary
Sanger, William
*Schieren, Chas. A.
Seamans, Miss Dorothy
*Sheldon, Mrs. Henry K.
Simons, Mrs. William R.
Smith, Mrs. Annie Morrill
Smith, Howard C.
Stutzer, Herman
Underwood, John T.
Vander Weyde, Mrs. N. J.
Walsh, Mrs. Anna F.
Webster, Mrs. Mary L.
*White, Alfred T.
White, Alexander M., Jr.
White, Miss Frances E.
White, Miss Harriet H.
*Woodward, Mrs. John B.
*Woodward, Col. Robt. B.

Life Members

By contribution of $500 or more, or by gifts of equivalent value
(Through the Botanic Garden)

Babbott, Frank L.
Bailey, Frank
Cary, Mrs. William H.
Childs, Eversley
Frothingham, Miss Elisabeth
Frothingham, John W.
Hicks, Henry
Jonas, Ralph
Loines, Miss Hilda
Potts, Maj. C. E.
Pratt, Charles M.
Smith, Mrs. Annie Morrill
Southwick, Dr. E. B.
Spalding, Mrs. Mary Bates

* Deceased.

(Through other Departments of the Brooklyn Institute)

Abraham, Lawrence E.
Achelis, Fritz
Adams, Mrs. Edward
Ager, John W.
Albertson, Rev. C. C., D.D.
Allan, Mrs. Mansfield
Allen, Miss Mary W.
Anderson, Mrs. John
Andrews, William A.
Appleton, R. Ross
Arnold, Miss Mary
Ayers, Dr. Messenger
Babbott, Dr. Frank L., Jr.
Banbury, James J.
Bannister, Miss E. C.
Batterman, Chas. H.
Batterman, Henry L.
Batterman, Miss M. P.
Baxter, F. W.
Baylis, A. B.
Baylis, Wm., Jr.
Betts, Mrs. Lillian W.[1]
Bigelow, Edward F.
Blumenthal, Maurice
Blydenburgh, Frank J.
Bolwell, Mrs. Sarah A.
Boody, Alvin
Bouck, James B.
Bowker, R. R.
Bramm, Miss Elizabeth
Brasher, Philip
Brasher, Reginald R.
Brockway, Miss E. A.
Brown, Miss A. W.
Brown, John W.
Brush, Dr. George W.
Buckley, Charles R.
Buckley, John D.
Buek, Mrs. Cecilia
Burnham, Dr. Clark
Cadman, Rev. S. Parkes, D.D.
Campbell, Mrs. Wm. Mitchell
Cary, Miss Alice B.
Cary, Isaac H.
Chapel, Miss Gertrude
Chapel, William L.
Chapman, Miss Leila H.
Chapman, Mrs. Leila T.
Chauncey, Rev. E. F.
Childs, William H.
Chittenden, Miss A. H.
Claflin, John
Clarke, Rev. L. Mason
Colyer, Mrs. Joseph H., Jr.
Corlies, Howard
Courtney, Wm. C.
Crane, Judge Frederick E.
Crittenden, Walter H.
Crowell, Mrs. Jeremiah
Cullen, Miss Margaret M.
Cunningham, Mrs. F. W.
Curtis, Henry S.
Dalby, Archibald B.
Davenport, Hon. Wm. B.
Davenport, Mrs. Wm. B.
Davis, William T.
De Motte, G. J.
Denbigh, Dr. John H.
Dennis, Dr. Frederick S.
Dennis, Mrs. Fred. S.
Dettmer, Hon. Jacob G.
Dick, J. Henry
Dixon, Theodore P.
Dodge, Cleveland H.
Dodge, Miss S. Ross
Dougherty, Andrew, Jr.
Dougherty, Edward J.
Draper, Ernest G.
Dreier, Theodore
Dykeman, Conrad V.
Eastman, Mrs. Wm. F.
Eger, Mrs. Theodore G.
Elmhirst, Mrs. Dorothy P. Whitney
English, George L.
Fahnestock, Gates D.
Fairchild, Julian D.[2]

[1] Deceased March 1925.
[2] Deceased Feb. 22, 1926.

Fara Forni, Mme. A. F.
Farmer, Walter B.
Farrell, James A.
Farrier, Albert Moses
Farrier, Frederick B.
Ferrier, Miss E. A.
Field, Miss M. Elizabeth
Fish, Mrs. Ivy Chapel
Flagg, Mrs. T. Benson
Flinsch, Rudolph E. R.
Foote, Alfred Sherman
Francis, Mrs. Lewis W.
Frank, Mrs. George S.
Franken-Sierstorpff, Countess von
Frazier, Kenneth
Frothingham, Elisabeth W.
Frothingham, Miss H. H.
Frothingham, John W.
Gibb, William T.
Gifford, Ira L.
Gilbert, Miss A. Louise M.
Gilbert, William T.
Good, Mrs. John
Good, Mrs. Wm. H.
Goodnow, David F.
Goodnow, Prof. F. J.
Goodnow, Henry R.[3]
Goodnow, Weston W.
Grace Church (Brooklyn)
Guild, Miss Mary A.
Hall, Charles H.
Halsey, William B.
Ham, Miss Dorothy B.
Harriman, Mrs. E. H.
Hathaway, Charles
Healy, Mrs. A. Augustus
Healy, Henry W.
Heckscher, August
Hester, Mrs. Ada Gibb
Hicks, Henry
Hill, William B.
Hoagland, Miss Anna M.
Hoagland, Miss Ella J.
Hollenback, Miss A. B.
Hooker, H. D.
Hooper, Mrs. Franklin W.
Hornaday, William T.
Horsman, Edward I.
Howe, Mrs. Sarah P.[3]
Howell, Hampton
Hubbell, Rev. Wm. S.
Huber, Joseph
Hudson, Mrs. Laura K.
Hulbert, Mrs. Henry C.
Hulst, Mrs. M. H. S.
Husson, Miss C. Julie
Hyde, Henry St. John
Hyde, James H.
Ingraham, Miss Frances
Ingraham, George S.
James, Dr. Walter B.
Jeffrey, Dr. Stewart L.
Jenkins, Alfred W.
Jennings, Walter
Johnson, Alvan R.
Jones, Miss Emily W.
Joost, Mrs. Martin
Kahn, Mrs. Otto
Kelekian, Dikran G.
Kellogg, Dwight H.
Kennedy, Hon. Elijah R.
Kennedy, Mrs. Mary A.
Kenyon, Mrs. Irene S.
Kenyon, Whitman W.
Kenyon, W. W., Jr.
King, Francis T.
Kunz, Dr. George F.
Ladd, Mrs. Wm. Sargeant
Lamb, Col. Albert E.
Lang, Mrs. Robert
Latimer, Miss Julia W.
Lewis, Mrs. August
Lewisohn, Adolph
Lincoln, Mrs. Dorothy Chapel
Litchfield, E. Hubert
Litchfield, Edward H.
Litchfield, Ed. H., Jr.
Littlejohn, Mrs. Thos. B.
Lockwood, Luke Vincent
Loeser, Charles
Loeser, Gustav
Love, Mrs. Henry D.

[3] Deceased.

Low, Ethelbert Ide
Low, Josiah O.
Lowber, Miss Ida E.
Ludlum, Clinton W.
Lyman, Frank
Lynde, Mrs. Martha R.
McAneny, Hon. George
McCarty, Rt. Rev. Edward [4]
McConnell, Rev. S. D.
McDonald, Rev. Robert
McKay, Mrs. John S.
Macbeth, Robert W.
Marshall, Wm. W.
Mason, William P.
Matheson, William J.
Mathews, Mrs. Albert H.
Maxwell, Henry L.
Maynard, Edwin P.
Mead, W. S. M.
Melish, Rev. John H.
Mercer, Rev. Arthur
Merwin, Miss Mary A.[5]
Moffat, David
Moffat, William L., Jr.
Mollenhauer, J. Adolph
Moore, Mrs. W. H.
Morgan, James L.
Morgan, John Hill
Morse, Miss Alice L.
Morse, Charles L.
Mundhenk, Herman
Nichols, William H.
Nostrand, P. Elbert
O'Connor, Mrs. W. B.
Ogilvie, Donald Manson
Olcott, Miss Martha W.
Orr, Miss Mary Moore
Otis, Miss Lillian L.
Packard, Miss Mary S.
Palmer, Henry L.
Parker, Asa W., Jr.
Parker, Gordon
Peet, Mrs. Louise H.
Pierrepont, John J.
Pierrepont, Seth Low
Polhemus, Miss R. A.
Potts, Charles E.
Pratt, Mrs. Frederic B.
Pratt, Frederic B.
Pratt, Harold I.
Prentice, James Howard
Prentiss, Russell E.
Prosser, Thomas
Prosser, Thos. Harold
Prosser, Walter R.
Putnam, Harrington
Putnam, Mrs. Wm. A.
Ramsay, Dick S.
Ramsdell, Mrs. F. Van N.
Rice, Mrs. Chas. E.[6]
Robinson, George C.
Robinson, Dr. Nathaniel
Ruger, Mrs. Adolph
Ruland, Irving A.
Ruscoe, Miss Rose
Russell, Rev. James T.
Russell, James T., Jr.
Russell, Mrs. Talcott H.
Sackett, Charles A.
Sanbern, Mrs. Frank H.
Sanger, Miss Lillian
Schenck, Miss Eunice M.
Schieren, Harrie Victor
Sheldon, Mrs. Anna B.
Sheldon, Henry
Shevlin, James
Slack, Mrs. Julia G.
Sloan, Francis H.
Smith, G. Foster
Smith, Mrs. Katherine L.
Smith, Theo. E.
Snow, Helmer
Spalding, Mrs. Mary Bates
Squier, Frank
Steele, Sanford H.
Stevens, Mrs. Roy G.

[4] Deceased June 11, 1925.
[5] Deceased.
[6] Deceased Feb. 1925.

Stevens, Shepard
Stewart, Dr. D. McC.
Stokes, Mrs. S. Emlen
Sullivan, Andrew T.
Taylor, Miss Besse
Taylor, William H.
Thayer, Mrs. Anna K.
Tiffany, Louis C.
Tucker, Mrs. Geo. S., Jr.
Turner, Mrs. Bertha C.
Tuthill, Miss Isabel H.
Valentine, P. A.
Van Anden, Miss S. M.
Van Nostrand, Mrs. J. B.
Van Sinderen, Mrs. Adrian
Van Sinderen, Adrian
Van Wyck, Richard
Wagner, Miss Marie
Waldbridge, Robert R.
Warbasse, Mrs. James P.
Ward, Miss Helen
Warner, Dr. Edwin G.
Weber, Mrs. Herman C.
Webster, Mrs. Ed. H.
Webster, R. P. S.
White, Harold T.
White, S. V., Jr.
White, William Augustus
Whitney, Sumner B.
Williams, Col. Timothy S.
Wisner, Mrs. Horatio S.
Woodward, Miss Mary B.
Young, Hon. Richard
Zabriskie, Mrs. Cornelius
Ziegler, Mrs. William

Sustaining Members [1]

By payment of $25 annually

Adams, Mrs. Ruth S. (E)
Anderson, Mr. John (G)
Babbott, Dr. Frank L., Jr. (M)
Baird, Robert B. (M)
Baker, Joseph J. (M)
Barnes, Herbert O. (M)
Blackman, Dr. Leonard (M)
Brooks, Mrs. Edward B. (G)
Bush, Irving T. (M)
Campbell, Miss Mary (M)
Case, Miss Marian Roby (G)
Crampton, Mrs. Edwin H. (G)
Doscher, Mrs. Alice B. (M)
Edwards, Mrs. Wm. Seymour (M)
Emerson, Mrs. William (G)
Enequist, John (G)
Faber, Helen H. (M)
Faber, L. W. (M)
Ford, James B. (G)
Foster, Charles L. (M)
Froeb, Charles (M)
Frothingham, John W. (M)
Frothingham, Mrs. J. S. (M)
Good, Mrs. William H. (M)
Graves, Robert N. (M)
Hammond, C. S. (M)
Havemeyer, T. A. (G)
Hicks, Henry (E)
Hubbell, Mrs. L. I. (M)
Ingraham, Mrs. Henry C. M. (G)
Jones, Harry L. (M)
Joost, Mrs. Martin (G)
Kirkman, Mrs. A. S. (M)
Lambert, Mr. Frank (M)
Latimer, Miss Mary (G)
Lawrence, L. W. (G)
Leech, Mrs. John E. (G)
Liebman, Julius (M)
Logan, William J. (E)
Longman, Walter (M)

[1] (G) Through the Botanic Garden; (M) Museum; (E) Educational Department.

Loomis, Guy (M)
Low, Mrs. Chauncey E. (M)
Low, William G. (M)
Luther, Mrs. George Martin (G)
MacLean, Mrs. Peter A. (G)
Marclay, E. G. (M)
Matthews, Dr. Harvey B. (M)
Munson, Frank C. (M)
Notman, George (G)
Perkins, Mrs. Grace (E)
Pierrepont, Miss Julia J. (M)
Pinkerton, Mrs. Robert A. (E)
Redfield, Hon. William C. (M)
Righter, Miss Jessie H. (M)
Rossin, Mrs. Alfred S. (M)
Rouss, Mr. P. W. (E)
See, Alonzo B. (G)
Scott, Dr. Peter (E)
Somers, Harold (M)
Squibb, Dr. Edward H. (E & M)
Sutphin, Mrs. Joseph H. (M)
Uhrbrock, Mrs. E. F. (G)
Van Norden, Howard L. (M)
White, Alexander M. (G)
Wood, Miss Emily S. (E)
Woodstock, Henry W. (M)
Zabriskie, Mrs. Cornelius (G)

Brooklyn Botanic Garden Annual Members

By payment of $10 annually

Abraham, Meyer
Adams, Miss Alice
Adams, Mrs. Horatio M.
Almirall, Mrs. Juan A.
Anderson, Mrs. John
Arms, Mrs. John Taylor
Augur, W. A.
Avery, Walter
Bailey, Mrs. A. W.
Bailey, Mrs. Frank
Bangs, C. Roy
Banker, John F.
Baron, Alexander
Baron, Olive H. G.
Bauman, Ben.
Beatty, Dr. George Wesley
Beers, John Frank
Behman, Miss Marguerite
Behr, Edw. A.
Benchin, Adolph
Bennett, Miss Josephine M.
Benson, Mrs. Philip A.
Berau, Henry
Bernstein, A. N.
Bernstein, Jacob J.
Bernstein, Moses
Betsch, William G. L.
Bixby, Willard G.
Blackman, Dr. William W.
Bliss, Miss Alice A.
Bloch, Irving Lee
Bohm, Mr. Albert
Bolland, Frederick T.
Bornmann, Dr. Alfred
Bossert, Mr. John
Bossert, Mrs. L.
Bowne, Miss Julia M.
Brackett, Miss Mary A.
Braman, Miss Irene M.
Brenner, Dr. Oscar
Brinton, Mrs. Willard Cope
Britton, Dr. N. L.
Brooke, James J.
Browning, Dr. William
Brunjes, John W.
Bryan, Mrs. Jane S.
Buchanan, Mrs. S. Edwin
Buckley, Jane
Buddenberg, William
Buerkle, W. A.
Burkard, Dr. George
Burrell, F. A. M.
Butterick, Miss Mary E.
Buxbaum, Isadore
Cabot, Dr. Irving
Cahoone, Mrs. Richards M.

Cahoone, Richards M.
Calder, Hon. William M.
Campbell, Miss Mary
Carpenter, Mrs. Norman J.
Cary, Isaac H.
Cary, Spencer C.
Cary, Mrs. William H.
Caspe, Sylvia
Chaber, Charles L.
Chanin, Irwin S.
Chertow, Boris
Child, Dr. Augustus L.
Chopak, Jules
Cisney, Thomas E.
Clapp, Mrs. A. P.
Clark, Dr. Frank H.
Clark, John J.
Clark, Dr. Raymond
Coffin, Mrs. Sherwood I.
Cohn, Dr. Michael A.
Comerford, James J.
Conover, Henry S.
Cooper, Mrs. Marin Le Brun
Cooper, Mr. Thomas H.
Cornell, Frank E.
Couper, Mrs. Grace F.
Coutts, Arthur O.
Crane, Dr. Claude G.
Cranford, Frederick L.
Crawford, Mrs. G. H.
Cuneo, N.
Curnow, Dr. Dorothea
Cutter, Ralph L.
D'Alboro, Dr. John B.
Dalzell, Edward T.
Daniel, Mrs. Walter T.
Dangler, Mrs. George Jacob
Dann, James E.
Dauernheim, A. M.
Davenport, Mrs. Henry Benedict
Davenport, Mrs. Henry J.
Davis, Mrs. Thomas J., Jr.
Deeves, Richard A.
Deininger, Mrs. Grace
Delafield, Mrs. John R.
Delatour, Dr. H. Beeckman
Deppe, William F.
De Silver, Mrs. Albert
Deutschmann, Mrs. E. A.
DeVos, Augustus R.
De Waltoff, Dr. D. B.
Dietz, Nicholas
Dickert, Mrs. Beula M.
Diller, Mrs. Frank J. W.
Doane, Albert C.
Dobson, Harvey O.
Dooling, Dr. John J.
Dorfman, W. Boris
Dow, Mrs. Luther B.
Dreier, Mrs. H. Edward
Dressler, George
Driggs, Miss Alice A.
DuBois, Mrs. Henry N.
Dudley, Percy S.
Dunbar, Dr. Alex. E.
du Pont, Mrs. T. Coleman
DuVal, Guy
DuVal, Mrs. Guy
Dwyer, Dr. H. Shirley
Earle, Mrs. Wm. P., Jr.
Eckstein, Harry
Emmerich, Rudolph
Engel, Dr. David
Englander, Benj. B.
Ericson, Emanuel
Fairbanks, Maria B.
Fairchild, B. T.
Feaster, Dr. Henry J.
Feldstein, Dr. Samuel
Feller, Henry
Felzmann, Ernest F.
Ferguson, William C.
Field, Mrs. William D. C.
Fichter, Jacob G.
Finkeldey, Alva E.
Forbes, Philip
Fox, Dr. Harold R.
Fulle, John H.
Funk, Dr. Merton L.
Gair, Mrs. Robert
Gans, Marion S.
Garrett, Mrs. Harriet
Gibbons, Mrs. Mary Flint
Gibbs, Wm. J.

Gill, Wm. H.
Gilvarry, James H.
Giovanna, Joseph Di
Given, Dr. J. B., Sr.
Gladding, Walter M.
Gleason, Marshall W.
Glier, William
Goell, Mrs. Charles
Goell, Mr. Jacob
Goetze, Mrs. Otto
Gollmar, Hugo C.
Gough, Dr. F. A.
Grof, Joseph A.
Greenberg, Charles
Greenberg, Dr. Sarah K.
Greve, Wm. M.
Gunnison, Herbert F.
Gunnison, Mrs. Raymond M.
Guyer, Sr., Louis G.
Hadden, Crowell
Hahn, Mrs. R. C.
Halstead, Mrs. J. Morton
Halsted, Mrs. Henry M.
Hanks, Lenda T.
Hargitt, Dr. Chas. A.
Harman, Mrs. George H.
Harragan, W. W.
Harrison, Miss Katharine I.
Harrisson, Mrs. Stephen M.
Hasenflug, August
Haskell, Paul C.
Haughton, Richard
Healy, Henry
Heller, Jacob
Hence, Mrs. Sarah Kyle
Hengerer, Julius
Herriman, Mrs. Rudolph F.
Hetkin, Henry
Higgins, Dr. Alice K.
Higgins, Charles M.
Hill, Lester W.
Hills, Mrs. James Mandly
Hills, Mrs. John
Hirsch, Dr. John
Hirschberg, Benjamin
Hollander, Frederick
Hollenback, Miss Amelia B.
Holmes, Miss R. Brickell
Holmes, Mrs. Edith
Hoogland, John W.
Hooker, Dr. Samuel C.
Hooker, Mrs. Samuel C.
Hopkins, Jesse L.
Horton, Mr. George S.
Howell, William R.
Hughes, Mrs. Mary
Hume, Mrs. Henry M.
Huncke, Mrs. Helen F.
Hutton, Miss Sarah E.
Ibbotson, Henry C.
Ide, Mrs. Charles W.
Ingersoll, Mrs. Raymond V.
Ittner, Wm. F.
Jackson, Edward
Jaffe, A. L.
Jantzer, George E.
Jennings, Miss Annie B.
Jennings, Bessie C.
Jennings, Dr. Frank D.
Jennings, Dr. John E.
Joachim, Dr. Henry
Johnson, Mrs. J. V.
Jones, Miss Helen Swift
Judge, Jas. P.
Kaiser, Diedrich W.
Kane, Mrs. De Lancey
Kant, Wm. H.
Kaplan, Abraham
Kelly, William J.
Kelsey, Wm. H.
Kennedy, Hon. E. R.
Kessler, Joseph G.
Ketcham, Miss Clara L.
Ketcham, Herbert T.
Keyes, Dr. James J.
King, F. T.
Kinsey, Henry R.
Klempner, Mrs. Ida
Knorr, Mrs. A. E.
Koeppel, Harry
Kuebler, William H.
Kuehnle, Charles H.
Lafrentz, F. W.
Lang, Frank

Langdon, Palmer H.
Lange, Dr. Hugo
Lathrop, Mrs. John H.
Lee, Prof. Frederic S.
Leeming, Thomas L.[1]
Lee, Dr. Marguerite T.
Lehrman, Jacob
Leihowitz, Dr. Philip
Lenges, Philip
Levine, Dr. Wm.
Levy, Dr. Saul Mortimer
Lewis, Miss Effie L.
Lewis, Dr. M. T.
Liebman, Mrs. Julius
Littlejohn, Mrs. Thomas B.
Loines, Mrs. Stephen
Longo, Michael F.
Louria, Dr. Henry W.
Love, John H.
Low, Miss Emma C.
Low, Josiah O.
Low, Mrs. Seth
Low, Mrs. Walter Carroll
Lyman, Frank
Lyons, Edward
McCarthy, Edward Joseph
McEvoy, Thomas J.
McKelway, Mrs. St. Clair
McLanahan, Mrs. Scott
Macfarland, Alexander E.
Malone, Winifred
Manker, Frank
Mantell, John
Marel, Dr. A. H.
Marino, Dr. A. W. Martin
Marino, Dr. Francesco
Mark, Jacob
Marshall, Mrs. William W.
Martin, Mrs. Delmer Duncan
Masone, Charles J.
Mattfeldt, Mrs. Mary W.
Maxwell, Earl C.
May, Hudson
Mead, D. Irving
Mellen, Mrs. Arthur W.
Melvin, Mrs. Jeanie
Merritt, Mrs. James Haviland
Metcalf, Mrs. Charles Peabody
Meyer, Frederick J.
Meyer, Henry
Meyer, Max C.
Miller, Chas. G.
Moffat, Mrs. F. D.
Moonia, Louis
Moore, Miss Mary M.
Morgan, Miss Charlotte E.
Morse, Miss Alice L.
Moult, Mrs. John F.
Mulford, Miss Esther Van H.
Muller, Adolf
Munson, Mrs. W. D.
Nesmith, Miss Charlotte
Nevin, Harris
Newman, Miss Grace
Newman, Miss Louise M.
Nichols, Wm. H.
North, Nelson L., Jr.
Nova, Algernon I.
Obermayer, Mr. Charles J.
Oguri, Dr. Kanzo
Ohly, Dr. John H.
Ovington, Charles K.
Paffard, Dr. F. C.
Paino, Angelo
Parrish, Dr. John W.
Parsons, Frank H.
Peckham, Mrs. Weeler H.
Penny, Jos. H.
Perlman, Dr. H. J.
Peters, Mrs. Wm. Sterling
Peterson, Andrew
Pierce, Mrs. C. T.
Pierrepont, Miss Anna J.
Pierrepont, Miss J. J.
Pisciotta, Dr. Jos.
Poggenburg, Robt. H.
Pomeroy, Dr. Ralph H.[1]
Pond, Miss Pearl F.
Pratt, Frederic B.
Pratt, Harold I.
Pratt, Mrs. K. Sloan
Pratt, Mrs. Richardson

[1] Deceased.

Price, Abraham
Prince, J. Lloyd
Purdy, Miss Maud H.
Pyle, Harry T.
Rains, Sol B.
Ramsay, Dick S.
Randall, Mrs. H. S.
Ranney, Dr. A. Webster
Raymond, Samuel
Redfield, Hon. William C.
Reid, Dr. Thos. M., Jr.
Reimer, Miss Margareth B.
Reimer, Mrs. Rudolph
Rentrop, Mrs. Bernard
Ris, Mrs. Bernard
Robbins, Miss Serena
Robertson, Norman A.
Rogers, Mrs. John R.
Ronfeldt, Chas. J.
Rosenberg, Philip F.
Rosenblum, Louis
Rosenthal, Siegmund
Rowe, Mrs. Frederick W.
Rubinowitz, George
Rushmore, Dr. Jacques C.
Ryder, Miss Harriet L.
Rynd, Dr. C. E.
Satterlee, Mrs. Herbert L.
Schlein, Dr. Julius
Schloh, Henry L.
Schlossberg, A.
Schmerzler, Henry
Scotto, Raphael
Seaver, Benj. F.
Seely, Miss Sarah A.
Seidman, Mrs. J. Arthur
Sexton, Edward A.
Shaw, Robt. Alfred
Sherwood, Mrs. John Lyman
Shreeve, Mrs. Herbert E.
Shultz, Selma
Siegmeister, Isaac
Silberman, Isidore M.
Sileo, Dr. Francis
Simpson, Miss Etta
Skerry, Dr. H. W.
Slee, John B.
Slepian, Morris
Sloan, Mrs. Russell R.
Smallheiser, Miss Lee
Smiley, Daniel
Smith, Mrs. Annie Morrill
Smith, B. Herbert
Smith, G. Foster
Smith, Dr. Isaac B.
Smith, James A.
Smith, Mrs. Nanny K.
Smith, Theodore E.
Snyder, Dr. Wm. H.
Somer, Dr. James A.
Somers, Arthur S.
Southard, Miss Edith Brett
Staab, Philip
Staber, Maud J.
Stanley, A. W.
Stark, Mrs. A. I.
Stedman, Miss Josephine
Steinbrink, Meier
Stellwagen, Fred. L.
Stewart, Mrs. Seth Thayer
Stoughton, Miss E. C.
Strack, Dr. G.
Straus, Dr. Henry W.
Strauss, Mrs. Nathan
Street, Mrs. Herman E.
Streit, Lewis A.
Strongin, Mrs. Grace
Sunshine, H. R.
Swahn, Mrs. Fanny D.
Swan, Frank C.
Sweedler, Nathan
Sweeney, G. Frank
Takami, Dr. T. Campbell
Talmage, Mrs. John F.
Taylor, Ronald
Tenopyr, Mrs. Lillian A.
Tetz, S. B.
Thayer, Mrs. John VanBuren
Thomas, Mrs. Oliffe W.
Thommen, Dr. August A.
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PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

MEMOIRS. Established, July, 1918. Published irregularly.

Volume I, *Dedication Papers:* comprising scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. Price $1.00, plus postage.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

36. *Influence of environmental factors on the infection of sorghums and oats by smuts. I. Experiments with covered and loose kernel smuts of sorghum.* 17 pages, 7 figures. 1924.

37. *Influence of environmental factors on the infection of sorghums and oats by smuts. II. Experiments with covered smut of oats and general considerations.* 21 pages, 3 plates. 1924.

38. *Physiologic races of oat smuts.* 10 pages, 3 plates. 1924.

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44. *Modes of infection of sorghums by loose kernel smut.* 17 pages, 3 plates. 1925.

45. *The inheritance of resistance of oat hybrids to loose smut.* 19 pages. 1925.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each.

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ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year.

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BROOKLYN BOTANIC GARDEN RECORD

VOL. XV JULY, 1926 NO. 3

PEAS AND PEOPLE

BY ORLAND E. WHITE

Curator of Plant Breeding and Economic Plants, Brooklyn Botanic Garden

Peas and people are very much alike. Both are compelled to live under the same laws of heredity, and this is a fundamental likeness. From this angle their differences, great as they undoubtedly are, appear trivial, for the basic problems of life concern us most; details are attacked last. So I repeat, as regards their relation to the laws of heredity—a basic problem—peas and people are astoundingly alike.

Each are made of combinations of characters. Different combinations in each produce different types. One pea plant is unlike another, as one person is unlike another, because of a dissimilar combination of characters. Thus arises individuality in both peas and people.

Then again both peas and people are composed of cells, and those tyrants of the cells—the chromosomes—little bits of grayish life matter to be seen in dividing cells in both peas and people as rod-like bodies much less than one thousandth of an inch in length. Peas have fourteen, people forty-eight. Lest too much importance be placed on the difference in number, it may be mentioned some ferns have one hundred and twenty-eight.

Chromosomes appear to be the arbiters of the destinies of both peas and people since they are believed to be the carriers of the hereditary bases of characters. Like little canoes, these chromosomes float their freight of character determiners down through the ages, from generation to generation, through individual to individual, from old to young. Thus it might be quite truthfully

said, that the destiny of the world, as regards not only peas and people, but all forms of life, is wrapped up in the shuffling of these tiny bits of organic matter and the infinitesimally smaller particles which they transport. Though they are the cards in the game of life, they themselves are ruled by the laws of chance.

As a penny falls heads or tails, so are the hereditary materials of both peas and people shuffled into new combinations that result in a new pea or a new person. Each has its being and does what it does, in part, because of a fortunate or unfortunate combination of hereditary materials which it gets from its parents.

To have good peas, a good inheritance is the first prerequisite, then the best of environments. So it is with people.

True-breeding, brown-eyed races of peas very rarely have other than brown-eyed offspring. Likewise, white-eyed races give rise to white-eyed progeny. But cross a brown-eyed race with a white-eyed race and what results? The offspring are all brown-eyed, though they had a *white-eyed* as well as a brown-eyed parent. But cross or mate two of these brown-eyed hybrid offspring and what happens? Their progeny consists of both brown-eyed and white-eyed plants in the proportions of three brown-eyed to one white-eyed. Thus the generation in peas corresponding to the grandchild generation in human beings consists of plants with the same characters in respect to eye-color as the grandparents, in spite of the fact that the parents were both brown-eyed.

Let us follow our pedigreed pea family through another generation of its genealogy, and see what the fates bring forth. The white-eyed plants have only white-eyed offspring, and will continue to do so indefinitely as long as only white-eye is mated with white-eye. Yet two of their ancestors were brown-eyed.

Now as to those with brown eyes. One third breed true, and like the white-eyed offspring, will breed true to brown eyes indefinitely, despite their white-eyed ancestor. But two thirds of these third hybrid generation brown-eyed plants will again, as in the second generation, have both brown and white-eyed plants in the ratio of three to one.

This illustrates one of the laws of heredity—*the law of segregation*. Brown-eye and white-eye are a pair of characters differentiating two varieties of pea plants. Each variety has its heredi-

tary character determiner for its special eye color. And these representatives of heredity, you recall, are associated with the chromosomes. Chromosomes for the most part live in pairs. In the new pea plantlet, as in the new baby, one of the chromosome pair is a maternal gift, the other is paternal. Seven paternal and seven maternal chromosomes go into the making of a pea plant; fourteen canoes, so to speak, full of character-determiner passengers—genes or factors, scientists call them. But only one pair carry the eye pigment determiners. If the pea plant breeds true to white-eye, one seat in each chromosome of a certain pair is occupied by a white-eye determiner. If the pea plant is pure for brown-eye, the same seats are occupied by brown-eye determiners instead. But if the plant child had a parent from each of these varieties—say a brown-eye mother and white-eye father—the chromosome seats naturally would be occupied in one by a brown-eye, and in the other by a white-eye determiner.

But the seeds of this hybrid would only show brown-eye characters, although they would have the hereditary determiners for both kinds. The brown pigment obscures whatever is responsible for the white-eye effect, so only brown is apparent. The expression of one determiner dominates the other. It has analogies with the expression—Mr. Brown and wife, rather than with Mr. and Mrs. Brown or H. W. and L. T. Brown.

Through the combinations of chromosomes, operating largely under the law of chance during the reproductive period of the pea plant, the details of which are too long and too complicated to relate here, the grandchild generation with its 3 : 1 ratio is produced. And thus we see why chromosomes might be called "tyrants."

From this brief glimpse into the more intimate phases of a pea plant's life, it is easy to understand how hybrid pea plants have both a visible and an invisible hereditary make-up.

The visible characters are the dominant members of the pair. The invisible are those occupying chromosome transportation seats, but seemingly inexpressive when their dominant mates are present.

From peas to human beings seems a great leap. But just this happened in the history of the study of heredity. The first laws

of heredity were discovered in peas by Gregor Mendel, after eight years or more of experimenting. This happened in 1865. That is, Mendel set forth the results of his experiments and the conclusions he drew from them in a paper he read before a local scientific society in Brünn, Austria (now Czechoslovakia), in 1865. In 1866 the paper was published in the Proceedings of the Society and sent to over one hundred and twenty libraries. But few people who understood the publication's significance apparently ever saw it. Darwin never did, neither did Galton, the father of eugenics. So it was all but buried. Mendel died eighteen years later, a disappointed old man. In 1900, three European botanists rediscovered the laws, independently of each other, and then the study of heredity as a science under the name of "genetics" really began. Almost any up-to-date text book on botany or zoology will tell more of this story and in greater detail. In two Brooklyn Botanic Garden *Leaflets* recently issued, the details are more complete. Strange to say, two of the rediscoverers were also working with peas, while one was experimenting with corn.

When it became so apparent that these laws controlled in part the destinies of numerous species of plants and animals, it was but natural to attempt their application to man. They fitted.

Eye-color in people, though of course a quite different character, is inherited in the same manner as eye-color in peas. But people are difficult material with which to do anything. They are not subject to direct experimentation. So information concerning them must be accumulated statistically by specially trained data collectors. Instead of gathering their information from fields of pedigreed peas, the ancestral characters of which have been accurately recorded on the spot for several generations, these students and investigators add to their own direct observations often by depending on the recollections and imperfect knowledge of the members of the families whose heredity they are trying to unravel. But, by gathering large quantities of information they tend to neutralize the effect of its less desirable quality. If among a thousand families, involving three to four generations in each, nine hundred and ninety of them tell the same story as regards the inheritance of eye-color, for ex-

ample, then we feel reasonably safe in thinking we are on the right track. The remaining ten may be errors of observation, or errors of fact in some other way. When possible, they are investigated and their cause or causes ascertained.

But facts themselves, however accurate, have only a nominal value, unless they are gathered for a purpose or centered around an idea. The world teems with ungrouped facts. And scientists are busy discovering new ones and assorting those already known into orderly collections with some meaning.

Through peas in the hands of a scientifically trained priest and teacher, the world came into possession of another core or idea center for fact grouping. The facts regarding heredity known then and since have helped to give birth to the science of genetics.

In previous paragraphs, I said eye-color in people is inherited through the operation of the same laws as eye-color in peas. If Mendel had tried to discover these laws by studying people, he probably would have failed. He understood very clearly *the importance of having the best material to work with* and spent much time in trying to find it. That is why he chose peas.

But how is eye-color in human beings inherited? People commonly describe many kinds of eye-color in themselves—hazel, gray, blue, black, brown, etc. Reduced to the simplest terms, eyes either have brown pigment or they are without it. "Blue eyes," as the term is commonly used in science, means the absence of all brown pigment. Even a small speck or two of brown pigment in the eye classifies the person as brown-eyed in genetics.

Blue-eyed people marry. Except in rare instances, their children are all blue-eyed. A blue-eyed individual desiring brown-eyed children must marry a brown-eyed individual. Eyes as yet have not been brought under the art of dyeing.

With brown-eyed people the case is somewhat different, because, genetically, two kinds of brown-eyed people walk the earth, those pure for brown-eye and those hybrid for brown-eye. Brown-eyed people with both chromosome seats occupied by brown-eye determiners will have only brown-eyed children. But brown-eyed people with a brown-eye determiner in one

chromosome seat and a blue-eye determiner in the other may have when married both brown-eyed and blue-eyed children, and these will occur in proportions approximating three with brown eyes to one with blue eyes. Thus you see in people the same kind of results you see in peas, because the same law governs the inheritance in both.

When people pure for brown-eye marry blue-eyed people, only brown-eyed children are born, though the children often are blue-eyed for the first few months. In some cases the brown pigment may be very late in developing, perhaps several years after birth. Brown-eyed children of such unions, if they should marry their own type, could have both brown- and blue-eyed children. But, if they had only one child, the chances are *three to one* that it would be brown-eyed. Nevertheless it *might* be blue-eyed, although a brown-eyed child is three times more likely to be born.

Brown- and white-eye in peas, and brown- and blue-eye in people are only illustrations of many thousands of pairs of characters and character-determiners in peas and people. As a student of inheritance views a pea or a person, each is a great collection of pairs of hereditary character-determiners which, under the appropriate environment, give rise to various kinds of characteristics, each according to its kind. Different environments may affect them differently either for better or for worse, causing "good" or "bad" traits to appear.

Environment and heredity are not quarrelsome forces, as many laymen seem to think. A person, like a pea, cannot help its heredity. Once born, that is settled. But an intelligent person can alter or modify many of his characters by looking after his environment. Some characters are but slightly changed, others very much so, by ordinary differences in environment, such as variations in climate. Which characters are which is still a field for much study, although some of each kind are well known. For the most part, the effects of various environments on the expressions of different character-determiners are unknown. This field is still a wilderness. But explorers are more and more penetrating it. Many paths have been started through it since 1900, when the study of inheritance as a science was born.

Probably all people are hybrids in regard to some of their

characters. The people of some countries are more hybridized than those of other countries. Great Britain, France and the United States are excellent examples of much hybridized peoples, while Denmark and Sweden perhaps are fair illustrations of the lesser hybridized peoples. Modern transportation has vastly increased the mixing of peoples and the marriage of all sorts of types, so that the existence of people pure in the greater proportion of their hereditary characters is largely mythical.

With peas it is different, for they naturally inbreed, whether wild or tame. What mixing has occurred has largely been brought about by man in his efforts to produce new and better varieties. The varieties, once created, are made to breed true. Otherwise they would be of little value to gardens and canneries. Civilized man demands only one type of pea in a can or in the measure of peas he buys from the green grocer. So the great majority of pea plants in the world are comparatively "pure." That is they breed true to their parent and ancestral line. Thirty generations of peas from one pea family, picked at random, lined up side by side would look very much alike. Their individual differences would be largely environmental. But in thirty generations of human beings from one family, say one American family picked at random, the differences would appear enormous. In the first case, an expert associated with peas all his life could not tell them apart. In the second, a child in its sixth year would have no difficulty in distinguishing them.

Peas do have great diversity, however. There are thousands of varieties. At the U. S. Experimental Sub-station at McMillan, in northern Michigan, 1,100 valuable commercial varieties are being grown this year, and at the Brooklyn Botanic Garden, in our breeding work, we have grown over 500 varieties, comprising all the most bizarre types, collected from all over the pea-growing world. Then each year we produce thousands of new types, of which varieties could be made, but it would serve little purpose, since most of them are neither better nor worse, commercially speaking, than those already in existence.

"How do peas differ?" asks the layman, especially those laymen reared in the cities. At the green grocers peas are only

peas. People never ask for a particular kind as they do for apples. But a trip through our "melting pot," as we sometimes call our experimental plant-breeding plots, will change forever the average person's concept of peas. They vary in flower from white, through salmon pink, to purplish red. The vines may be pea giants ten to twelve feet tall or pea dwarfs only one foot high. Four pods may hang in one cluster, or only one or two. The leaves may be with or without tendrils; green, bluish-green, yellow, or almost white in color. Some varieties have canary yellow pods, others have bright warm red, others dark purple, and still others various shades of green and bluish-green pods.

Some varieties have pods with no parchment lining, and these can be eaten like string beans. In Chinatown, New York City, this kind is sold.

Almost a hundred years after these non-parchmented or sugar peas were introduced into France, Madame de Maintenon, queen, in all but name, of one of the most sumptuous courts ever known to civilization, writes: "The subject of Peas continues to absorb all others; the anxiety to eat them, the pleasure of having eaten them, and the desire to eat them again, are the three great matters which have been discussed by our Princes for four days past. Some ladies, even after having supped at the Royal table, and well supped too, returning to their homes, at the risk of suffering from indigestion, will again eat Peas before going to bed. It is both a fashion and a madness."

All themes must close. This quotation from the intimate letters of a beautiful lady seems a fit ending for a study of associations between two of the most interesting of earth's life forms —peas and people.

JAPANESE PRAYING MANTIS REPORTED FROM THE BROOKLYN BOTANIC GARDEN

By George P. Engelhardt

Curator, Department of Natural Science, Brooklyn Museum

The finding this spring of an egg mass of the praying mantis (*Paratenodera sinensis* Saussure) promises to add to the insect fauna of the Brooklyn Botanic Garden a creature more grotesque and more ferocious in appearance than any other found there before. To the uninitiated a surprise encounter with this newcomer among the shrubs and flowers of the Garden certainly should prove a startling experience, but let us assuage at once any feeling of apprehension, for the creature is perfectly harmless; in fact it is a beneficial insect which preys upon all sorts of other insects, and as such should be entitled to at least a benevolent consideration.

The accompanying illustration (Fig. 11) is reproduced from a photograph of specimens of imagos presented to the Botanic Garden by Mr. William T. Davis, and egg-case collected in the Garden by Dr. Gager, and will serve to acquaint the reader with the general appearance of the insect in question. But this may not suffice to make clear to all its proper place in the insect world. Who, for example, not versed in the subject would guess that its nearest relatives are to be sought among the Orthoptera, an order which includes so incongruous an assemblage as the grasshoppers, roaches, and walking-sticks? At any rate, thus associated, we find that our new friend belongs to the Mantidae, the only family of the order Orthoptera of which all the members are carnivorous. The representatives of mantids native to North America are but few in species and insignificant in size when compared with the great variety of large creatures from tropical countries. *Mantis argentina,* from South America, is so large and powerful as to be able to seize and eat small birds. Another species native to Central Africa resembles so closely the brilliant flowers of a plant as to beguile and capture insects that visit the blossoms. This mantis, known as " devil's flower," furnishes a striking example of the phenomenon of aggressive resemblance.

FIG. 11. Japanese praying mantis (*Paratenodera sinensis* Saussure). Male (left), female (right), and egg-case on branch of *Hydrangea*. (5771.)

All of the mantids, in color and form, more or less resemble the foliage and stems of the plants among which they habitually lurk while waiting for their prey. Their usual attitude of resting with knees bent and the front legs clasped together and held forward has suggested such popular names as "praying mantis" and "soothsayer," or "Prie Dieu" in France, and "Gottesanbeterin" in Germany. But these names are misleading, for the only prayer that could interest the mantis would be that some unwary insect might approach near enough to be grasped and eaten. "Johnny Cockhorse," as they are called in England, and "Rearhorse" in the South, certainly are more fitting names than those suggesting piety. They are bloodthirsty creatures, forever quarreling among themselves, and many a fierce battle is fought by the males in which the victor makes a feast off the body of the vanquished. The females, which are larger and stronger than the males, after accepting the attentions of courtship are quite likely to end it by seizing and devouring their mates.

After this preamble on the Mantidae in general, let us consider the probability as well as the desirability of our newcomer, *Paratenodera sinensis,* establishing a permanent residence in the Brooklyn Botanic Garden. The presence of this mantis in scattered localities in Brooklyn has been known to entomologists for some time. In the fall of 1917 an adult specimen was collected in a garden on the Park Slope and brought to the Museum. In the Ridgewood section of Brooklyn a colony originating from egg clusters placed in his garden by Dr. Felix Metzner, of 142 Woodbine Street, about fifteen years ago, has maintained itself ever since. The most flourishing colony, however, has established itself in the suburban district of Middle Village, where Charles Rose, a collector of insects, has taken hundreds of the egg masses, season after season, finding them among blackberry and catbriar brambles on waste lands. Eggs from this source planted along the Wild Flower Path in the spring of 1925 by Jacob Doll, curator of Lepidoptera of the Brooklyn Museum, no doubt have started the colony in the Botanic Garden, which is now entering upon its second generation. Just how it will flourish remains to be seen. So far, only one egg cluster (Fig. 11) has come under observation, but probably there are more, as no diligent search has been made.

Mr. William T. Davis, Vice-President of the Staten Island Institute of Arts and Sciences, and also a life member of the Botanic Garden, has called our attention to one factor which is likely to work against an increase in considerable numbers and that is the gray squirrel. These animals are known to search for the egg clusters, not because they somewhat resemble hickory nuts, but because they like the egg flavor. In the New York Zoological Park, and in other places where squirrels are plentiful, attempts to start Mantis colonies have failed. Again referring to Mr. Davis, our best authority on the subject, we learn from an article published by him (*Bulletin of the Brooklyn Entomological Society,* Vol. XIII, No. 4, October 1918) that the first record of *P. sinensis* in this country came from Meehan's Nursery, Germantown, Pa., in 1896, indicating the accidental introduction of egg masses on nursery stock imported from Japan. Since then the insect has been reported repeatedly from numerous places in Pennsylvania and New Jersey, but nowhere as common as near the original source; for in 1902 Philip Laurent, of Philadelphia, gathered about half a barrel of egg masses near his home at Mt. Airy.

The newly hatched mantids, in late May or early June, are covered with a thin delicate pellicle which is soon cast off and eaten. Still clinging to the egg cluster, a hundred or more in number, they look like an animated mass of little bits of string. Almost at once they display their voracity by attacking each other. Then, dispersing among the neighboring vegetation, they begin their stealthy attacks upon other insects, at first plant lice and the like, but gaining strength with growth, bees, flies, wasps, beetles, caterpillars, grasshoppers—everything within their reach and power is greedily seized. They disdain all dead food and never make chase for the living, but warily, patiently, and motionless they watch till a victim is near enough to be grasped with a rapid thrust of the spiny front legs. Molting four or five times, they do not attain maturity until September and October. The wings, also not fully developed until then, are strong enough to support the slender males on short flights, but not the heavier, distended bodies of the females. Consequently any extension in the range of the species under natural conditions must be slow.

From the Wild Flower Path, where the first eggs were planted in 1925, to the section of Hydrangeas, west of the Conservatories, where the egg mass was found last fall, is a distance of about 1,500 feet. This may be accepted as a good average distance of travel for a female mantis during its one season of active life. The eggs, laid simultaneously in a mass of about one hundred, are at first enveloped by a sticky substance which quickly hardens into a tough silky fiber, forming a protecting cover against temperature changes until spring and hatching time arrives again.

Preying indiscriminately upon all sorts of insects, injurious and beneficial alike, the Japanese mantis can hardly be considered of economic importance. Its good deeds are apt to be offset by those that are bad. No criticism, either for or against the insect, has reached us from regions where successful colonies have been established. It does furnish however an object lesson in nature study of exceeding interest, and in this connection it should prove of good service in the educational work of the Brooklyn Botanic Garden.

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

The Botanic Garden is open free to the public daily from 8 a.m. until dark; on Sundays and Holidays open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, and Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street and Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS
OF THE
BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

MEMOIRS. Established, July, 1918. Published irregularly.

Volume I, *Dedication Papers:* comprising scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. Price $1.00, plus postage.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

37. Influence of environmental factors on the infection of sorghums and oats by smuts. II. Experiments with covered smut of oats and general considerations. 21 pages, 3 plates. 1924.

38. Physiologic races of oat smuts. 10 pages, 3 plates. 1924.

39. Relative susceptibility of selections from a Fulghum-Swedish select cross to the smuts of oats. 17 pages, 4 plates. 1925.

40. Physiological specialization of Ustilago hordei. 21 pages, 1 figure. 1924.

41. Factors influencing the infection of wheat by Tilletia Tritici and Tilletia laevis. 24 pages, 4 plates. 1924.

42. Variation among the sporelings of a fertile sport of the Boston fern. 27 pages, 15 figures. 1924.

43. Inheritance studies in Pisum. V. The inheritance of scimitar pod. 14 pages, 10 figures. 1925.

44. Modes of infection of sorghums by loose kernel smut. 17 pages, 3 plates. 1925.

45. The inheritance of resistance of oat hybrids to loose smut. 19 pages. 1925.

46. Geographical distribution and the cold-resisting character of certain herbaceous perennial and woody plant groups. 10 pages. 1926.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication.

SEED LIST. Established, December, 1914. Since 1925 issued each year in the January number of the RECORD.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $6.00 a year.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year.

GENETICS. Established, January, 1916. Bi-monthly. Subscription, $6.00 a year.

BROOKLYN BOTANIC GARDEN

RECORD

Vol. XV OCTOBER, 1926 No. 4

EDITED BY
C. STUART GAGER

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BROOKLYN BOTANIC GARDEN

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† Resigned, September 15, 1926.
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BROOKLYN BOTANIC GARDEN

RECORD

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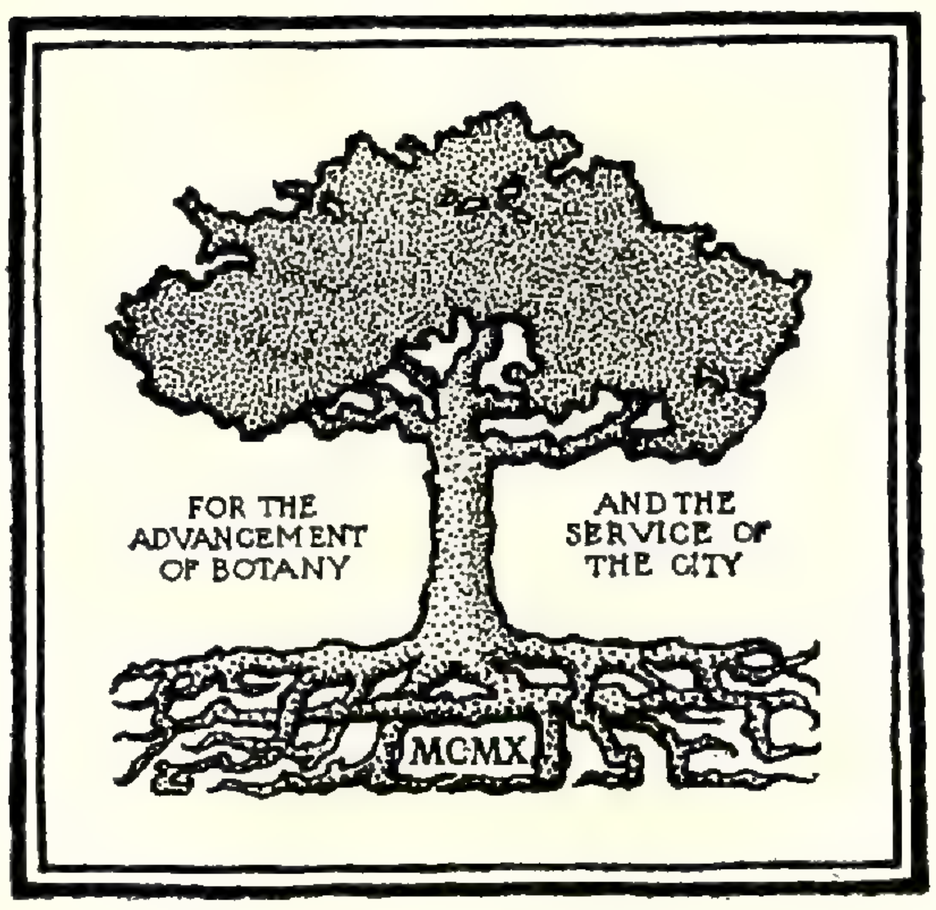

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BROOKLYN BOTANIC GARDEN RECORD

VOL. XV OCTOBER, 1926 NO. 3

PROSPECTUS: 1926–7

I. COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters relating to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, are finding the collection of useful plants in the economic plant house, and also our Japanese Garden, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under the guidance of a docent. Illustrated lectures for geography classes may also be arranged for at the Garden.

The systematic collection in the main part of the Garden, where the living plants are arranged by orders and families, is proving of great value for demonstration to visiting high school classes in botany.

A. Talks at Schools.—The principals of public or private schools may arrange to have lantern talks given at the schools on various topics related to nature study, such as garden work with children, tree planting, and Arbor Day. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

B. School Classes at the Garden.—(*a*) Schools not provided with a stereopticon, and other schools, may arrange for classes, ac-

companied by their teachers, to come to the Botanic Garden for lectures either by the teacher or by a member of the Garden Staff.

(*b*) Notice of such a visit should be sent at least *one week* previous to the date on which a talk is desired. Blank forms are provided by the Garden for this purpose. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Spring and fall announcements of topics will be issued during 1926–7.

(*c*) The Garden equipment, including greenhouses, plant material, lecture rooms, lantern and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance so that such work will not conflict with other classes and lectures. For High School classes address *Curator of Public Instruction.* For Junior High and Elementary School classes address *Curator of Elementary Instruction.*

(*d*) The principal of any elementary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given during the fall or spring to a class. These lessons will be worked out for the most part in the greenhouse. Such a course must be arranged for in advance, and the class must be accompanied by its teacher. This is adapted for pupils above the third grade.

C. Seeds for School and Home Planting.—Penny packets of seeds are put up by the Botanic Garden for children's use. In the early spring, lists of these seeds and other information may be secured on application to the *Curator of Elementary Instruction.*

D. Conferences.—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gardening and nature study. The last Monday afternoon of each month will be reserved for such conferences: appointments must be made in advance. Address Miss Ellen Eddy Shaw.

E. Study and Loan Material.—To the extent of its facilities, the Garden will provide, on request, various algae and protozoa, as well as living plants, leaves and twigs, or other plant parts for study. Where containers are necessary, as in the case of the algae and protozoa, they must be furnished by the school. Petri dishes will, on request, be filled with sterilized nutrient agar ready for use in the study of bacteria and molds. They should be

delivered to the Garden, *clean,* and in general one week before the agar is desired. In all cases arrangements must be made by the teachers for calling for such material.

MATERIAL USUALLY AVAILABLE

1. Protozoa: Paramoecium, Vorticella, and others.
2. Pleurococcus.
3. Spirogyra.
4. Vaucheria.
5. Blue-green algae.
6. Moss plants: gametophyte and sporophyte, with capsules.
7. Fern prothallia. For these, a Petri dish with a cover is the best container to bring, since the prothallia dry out quickly.
8. Fern sporophylls (with sori).
9. Coleus and Tradescantia—Variegated green and white, loaned for photosynthesis experiment.
10. Cacti, Pitcher plant, Sundew (*Drosera*), and Venus's Flytrap (*Dionaea*)—Loaned for demonstration.
11. Elodea—To show movement of protoplasm.
12. Various collections loaned for exhibit: *e.g.,* lichens, fungi, plant diseases, fruits, demonstrations of Mendel's law.

Teachers may also arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction.*

F. Loan Sets of Lantern Slides.—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short syllabus of explanatory nature. In all cases these sets must be called for by a special messenger and returned promptly in good condition. The subjects now available are as follows. Other sets are in preparation.

1. Plant Life
2. Spring Wild Flowers
3. Common Trees
4. Fall Wild Flowers
5. Forestry (2 sets)

II. DOCENTRY

To assist members and others in studying the collections the services of a docent may be obtained. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see page 3 of the cover of this PROSPECTUS.

III. COURSES OF INSTRUCTION

A. Children's Gardens: Nature Study

For the work in Children's Gardening and Nature Study the following equipment is available:

1. *The Children's Gardens,* on a piece of land about three-quarters of an acre in extent, in the south-east part of the Botanic Garden, divided into about 150 plots which are used throughout the season for practical individual instruction in gardening.

2. *The Children's Building,* at the north end of this plot, containing rooms for consultation and for the storage of tools, seeds, notebooks, special collections, etc.

3. *The Instructional Greenhouses,* three in number, for the use of juvenile as well as adult classes for instruction in plant propagation and related subjects.

4. Two *Classrooms* (in addition to the Boys' and Girls' Club Room in the Laboratory Building), equipped with stereoscopes and views, a stereopticon, plant collections, economic exhibits, models, and other apparatus and materials for instruction.

5. Two *Laboratory Rooms,* with the usual equipment for plant study.

6. The *Auditorium,* on the ground floor, capable of seating 570 persons, and equipped with a motion-picture lantern and stereopticon.

In addition to these accommodations, the dried plant specimens in the herbarium and the living plants in the conservatories and plantations are readily accessible, while the main library and chil-

dren's library, which contain a comprehensive collection of books on every phase of gardening and plant life, may be consulted freely at any time.

1. *Courses for Children*

The following courses are open to all boys and girls. Enrollment in these courses entitles the boy or girl to membership in the Boys' and Girls' Club of the Brooklyn Botanic Garden. This club, having an active membership of about 1,000, meets four times a year for discussion of subjects related to plant life. Papers, by members, on various botanical and horticultural subjects, are read at these meetings, and the speakers are then entitled to a silver pin, providing they have satisfactorily completed courses of study at the Garden extending over at least six months. For announcement concerning Children's Room see page 16.

A1. Fall Greenhouse Work.—The following courses are self-explanatory and are for both beginners and advanced students:

Class A.—Open to boys and girls who have never taken any greenhouse work before. Bulbs used: narcissus, oxalis, primrose; also geranium cuttings. *Saturday* mornings at 9:15. *Fee, fifteen cents. October 16 to December 18.*

Miss Hammond and Miss Clark.

Class B.—Open to boys and girls over thirteen years of age. Subjects studied: hyacinth, Easter lily, calla lily, the botany of common cultivated plants, etc. *Fee, twenty-five cents. Saturday* mornings at 9:15, *October 16 to December 18.* Miss Woodward.

Class C.—Open to boys and girls who have been in at least two fall bulb classes before this. This class is for advanced work. The bulbs used will be hyacinth, tulip, narcissus, oxalis. Geranium cuttings and primroses will also be used. Time of class, 10:30, *Saturday* mornings. *Fee, fifteen cents. October 16 to December 18.*

Miss Hammond and Miss Clark.

Class D.—Open to any boy or girl. Subject: the making of garden Christmas presents. There will be a choice of gifts. Some of the articles made will be the following: a flower basket, seed packet, flower book-mark, painted pot and plant to go in it, flower calendar, wooden box with flower design, etc. *Saturday* mornings at 10:30. *Fee, cost of materials. October 16 to December 18.*

Miss Hammond.

Class E.—Silver Pin work as applied to greenhouse and garden work. The members of this class will be selected from students eligible for this work. *Fee, twenty-five cents.* Miss Hammond.

A2. Junior Gardeners' Course.—This is a course for boys 14–17 years of age. Lessons are given in the care of border and other flower beds, in the weeding and care of small vegetable gardens, in mowing and watering lawns, repotting plants, etc. This is planned to fit boys for summer work and to enable them to obtain positions. Hours to be arranged. *Fee, fifty cents.*
Miss Shaw.

A3. Preparation for the Outdoor Garden.—The following classes are open to boys and girls during the spring of each year. The courses are planned for a better understanding of plant life and so that the outdoor garden may become a more intelligent piece of work. On account of limited space in the Children's Greenhouse, classes are limited to twenty. The fee for each course is *fifteen cents* to cover the cost of material.

Boys' Spring Course.—(a) *Saturday* mornings, 9–10:15, *February 12 to April 9.* (b) *Saturday* mornings, 10:30–11:30, *February 12 to April 9.* Miss Hammond and Miss Clark.

Girls' Spring Course.—(a) *Saturday* mornings, 9–10:15, *February 12 to April 9.* (b) *Saturday* mornings, 10:30–11:30, *February 12 to April 9.* Miss Woodward.

A4. Advanced Work for Older Boys and Girls.—How to raise plants, mix soils, transplant, start seedlings for outdoor gardens, etc. Boys and girls who have taken spring courses under A5 are eligible for advanced work. The fee for the course is *twenty-five cents.* Each student may take home his plants and seedlings. This course is open to both boys and girls over twelve years of age. *Saturday* mornings at 9:30, *January 8 to March 26.*
Miss Hammond.

A5. The Beginners' Garden.—Open annually to 50 boys and girls who have never had instruction in gardening at the Brooklyn Botanic Garden. This course takes up the subject of the small garden, what to plant, how to plant it, care, replanting, etc. *Application for plots should be made in person or in writing before March 1.* Size of plots 8 ft. by 10 ft. All crops belong to the individual. *Fee, twenty-five cents. Saturday* mornings, 9–12, *April 16 to October 8.* Miss Woodward and Miss Clark.

A6. Second Year Gardens.—Open to 50 boys and girls who have had one or more seasons at the Brooklyn Botanic Garden—a continuation of Course A3. Registration should be made before September 1 of each year for the following year. *Fee, twenty-five cents. Saturday* mornings, 9–12, *April 16 to October 8.*

Miss Woodward.

A7. Junior Garden Assistants.—Open to older boys and girls, or to those who have mastered Courses A2 and A4. Size of plot 10 ft. by 20 ft. These gardens are for the raising of vegetables. The work is in the nature of a project, "How much can one raise on a plot 10 ft. by 20 ft.?" Hours to be arranged. The student must put in at least two periods a week during the summer vacation, and, if possible, three. Registration date: *April 2. Fee, fifty cents.*

Miss Hammond.

A8. Advanced Nature Work.—A course designed for those older boys and girls who have taken Courses A1–A5. Herbarium specimens will be prepared and the simpler principles of plant classification studied. Projects will be assigned to individuals. *Open only to pupil assistants of the Garden.* Hours to be arranged. *No fee.*

Miss Hammond.

A9. Nature Study for Boy Scouts, Girl Scouts, Camp Fire Girls, Scout Leaders, and Others.—Short courses of at least four periods each, with talks, demonstrations, and field trips in the grounds of the Botanic Garden and Prospect Park to study trees, shrubs, etc. The instruction and schedule dates will be adapted to meet the needs of the various groups that apply. *Open only to groups of at least ten persons.* Hours to be arranged. *No fee.*

Dr. Graves, Miss Hammond, and assistants.

A10. Special Work for High School Pupils.—A course in gardening or greenhouse work adapted for high school pupils. Classes to be arranged for by the high school teacher. *No fee.*

Miss Shaw, Miss Hammond.

A11. Preparatory Course for Scout Test.—Identification of wild flowers and trees. *Saturdays, 11 a.m. No fee. October 9 to May 28.*

Miss Hammond and Miss Clark.

2. *Courses for Teachers*

The following brief courses are designed primarily for teachers who wish to extend their knowledge of nature study and gardening for use in their school work, without taking the longer courses described under B, page 9. It should be noted that only the latter courses are accepted by the Board of Education for teachers' credits.

A21. Greenhouse Work for Teachers.—Not given in 1927.

A22. The School Garden.—See B5, p. 11.

A23. Spring Nature Study for the Classroom.—This course of three lessons will acquaint the teacher with common nature study material which may be taken into the classroom during the springtime. The work will be based on the syllabus of nature study for the schools of New York City, and will be entirely practical. *No fee. Mondays, 4 p.m., May 7–21.*

Miss Hammond.

A24. Fall Garden Work.—Three lessons on home plants; window boxes; indoor planting of bulbs; the outdoor bulb bed. *Fee, one dollar. Mondays, 4 p.m., October 4–18.* Miss Shaw.

A25. Fall Nature Study.—This course is a complement to the spring nature study work and the material used will be the common material one would use in classroom work, showing seed dispersal, evergreens, deciduous trees, etc. Such subjects as Nature's preparation for winter will be considered. Three lessons. *No fee. Thursdays, 4 p.m., October 7–21.* Miss Hammond.

A26. Greenhouse Work.—A course planned for those who have taken "B3, Principles of Agriculture and Horticulture." Fifteen weeks of practical work in the greenhouse. *Limited to 20 members. Fee, eight dollars. Tuesdays, 4 p.m., beginning October 5.*

Miss Shaw.

A27. Greenhouse Work.—A similar course to that offered in A26. Fifteen weeks. *Limited to 20 members. Fee, eight dollars. Thursdays, 4 p.m., beginning October 14.* Miss Shaw.

B. Courses for Teachers of Children's Gardening and Nature Study

The courses for teachers in children's gardening are planned not only to prepare for garden work, but for the teaching of nature study as well. The courses are so arranged that they emphasize not only the theory of each subject, but its actual practice, either in classroom, greenhouse, garden, or field. At the same time the work is correlated to meet the needs of each grade of the elementary school. There is an increasing demand for good nature study work in our schools, and we make a special point of giving simple, definite, helpful work, grading it so that it applies directly to the immediate needs of our own city schools. Practice with classes of children of different ages is given in all this work.

The requirements for entrance are a certificate from a city training or a normal school, a college diploma, or several years of certified successful teaching. These courses may be completed during one year, or may be extended over a period of two or more years. The *fee for the entire course is thirty-five dollars,* payable in full at the time of registration, or course by course in advance. No money will be refunded if the student drops the work, and no monetary allowances will be made for courses taken at other institutions, although time allowances will be made.

Special stress is put upon the outdoor garden practice. This practice is of two kinds: (1) Practice with children. There are one hundred and fifty children in our outdoor garden, and every opportunity is given for practice in working with children and for the solving of problems connected with this phase of the work. (2) Practice in the teacher's garden. Each member of the class has a garden of her own and works it herself, thus performing all gardening operations to be taught later to children.

To those who satisfactorily complete this course a certificate will be given. *The five courses offered in children's gardening constitute one unit.* Open only to teachers.

These courses have been accepted by the Board of Education of the City of New York for teachers' credits as follows:

1. Any of the courses will be accepted toward meeting clause "b" of the conditions of eligibility for a high-school license in biology.

2. The course in Pedagogy of Botany and Educational Principles of Children's Gardening (**B4**) will be accepted as a satisfactory 15-hour course in Pedagogy toward meeting the requirement of 60 hours' work in Pedagogy in lieu of the written test in Principles and Methods of Teaching for Promotion License.

3. This course will be accepted as a pedagogical course, and any of the other four courses will be accepted as an academic course toward meeting the conditions of exemption from the academic paper in the examination for license as assistant to principal. Such exemption is granted to those who offer 120 hours of satisfactory work, 60 of which must be in the Science of Education and 60 in some branch of literature, science, or art, such 120 hours' work not being accomplished wholly within one academic year.

These courses have also been accepted by the Brooklyn Teachers' Association and appear in its syllabus of courses.

The individual student may apply at any college for credits on these courses, which will be granted according to individual merit.

B1. General Botany.—Thirty sessions. A course designed to make clear the fundamental principles of morphological and physiological botany. Although, with a view to correlation with the other courses described below, particular emphasis is laid upon the higher plants, all of the main groups of plants are considered, by means of informal lectures, discussions, demonstrations, and visits to the living material in the conservatories and the outdoor plantations. *Fee, $5. Thursdays,* 4 p.m., beginning *October 7.*
Dr. Graves.

B2. Nature Study.—Thirty sessions. This course covers the plant material used in teaching nature study, and includes the identification of the common trees, shrubs, plants, wild flowers, and weeds. Mounts, charts, and diagrams are made. The student becomes familiar with the actual material. The course is entirely practical, work being done in both field and laboratory. Two hours of class work are credited as one hour. *Fee, $5. Tuesdays,* 4 p.m., beginning *September 28.* Miss Hammond.

B3. Principles of Agriculture and Horticulture.—Thirty sessions. This course will be especially helpful to teachers. The principles of horticulture are considered and applied in a practical way through greenhouse, laboratory, and lecture work. The

greenhouse work includes the following subjects: plant propagation by means of bulbs, rhizomes, roots, seeds, etc.; the care of the greenhouse; house plants; window-box materials; fertilizers. Insect and fungous pests, grafting and pruning are also included from both a practical and a theoretical point of view. *Fee, $7. Wednesdays,* 4 p.m., beginning *September 29.*

Miss Shaw and Mr. Free.

B4. Pedagogy of Botany and Educational Principles of Children's Gardening and Nature Study.—Not given in 1926–27.

B5. Garden Practice.—Fifteen sessions. This course is entirely practical and includes all the outdoor work of the student in his own garden, applying the principles of agriculture and gardening, work with children in the garden, basketry and woodwork. *Fee, $5: for summer practice, fee $8 additional. Thursdays,* 4 p.m., *February 3 to May 19.* Miss Shaw and Miss Hammond.

C. Courses for the General Public

The following courses are open to any one who has a general interest in plants. Teachers are welcome. They are *free to members of the Botanic Garden;** for others a small fee is required, as specified. Registration should be made with the instructor in person or by mail at least one week before the course opens, in order that adequate material, etc., may be provided. *No course will be given when less than six apply.*

1. *Full Year Course*

C10. The Life of Plants.—Thirty exercises, extending through the school year, consisting of informal lectures, demonstrations, and short trips to the conservatories and outdoor plantations. No previous knowledge of botany is necessary. The main purpose of the course is to enable any who are interested to become acquainted with the different main groups of plants—their life histories, habits, economic uses, etc. Bacteria, algae, fungi, lichens, mosses, ferns, cycads, and flowering plants are considered. The various functions manifested by plant life in general, such as growth, reproduction, sensitiveness, movement, respiration, and

* For information concerning membership in the Brooklyn Botanic Garden consult the third page of the cover of this PROSPECTUS.

metabolism, are also discussed. *Fee, $5. Thursdays,* 4 p.m., beginning *October 7.* Dr. Graves.

2. Fall Courses

C4. Gardening in the Fall.—Six lessons, with practical work in the greenhouse, on the methods of making cuttings, the various kinds of bulbs for fall planting, their treatment and care, the proper management of house plants, and a discussion of the kinds suitable for cultivation. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee, $3.00. Thursdays,* 4 p.m., *September 30 to November 4.* Mr. Free.

C5. Trees and Shrubs in their Winter Condition.—Eight outdoor lessons in the Botanic Garden and elsewhere in Greater New York on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. *Fee, $4.00. Saturdays,* 2:30 p.m., *October 2 to November 20.* Dr. Graves.

3. Spring Courses

C1. Plants in the Home.—How to grow them. Six talks with demonstrations. Practice in potting, mixing soils, making cuttings, etc. This course deals with the principles to be followed in raising plants. The members of the class have the privilege of keeping the plants they have raised. (Not offered in 1927.)
Mr. Free.

C3. The Flower Garden.—Making the most of it. Five lessons. How to improve soils and get results from planting; old-fashioned flowers; annuals; summer bedding; vines for screening unsightly objects; rose culture; growing of ornamental shrubs; pruning; how to make a lawn and maintain it. *Fee, $2.50. Thursdays,* 4 p.m., *February 17 to March 17.* Mr. Free.

C7. Evolution in the Flowering Plants.—Three illustrated lectures, followed by visits to the conservatories. (Not offered in 1927.)

C12. The History of Botany.—Three illustrated lectures. 1. Natural science of the ancients and Middle Ages. 2. The study of plants from the discovery of America to Linnaeus and the

Jussieus. 3. The idea of plant evolution in the nineteenth century and after. *Fee, $1.00. Fridays,* 4 p.m., *March 4–18.*

Dr. Gundersen.

C8. Plant Families.—Eight outdoor lessons in the botanic garden, taking up the structure of flowers and the characteristics of the more important plant families. *Class limited to 25. Fee, $4.00. Fridays,* 4–5 : 15 p.m., *April 29 to June 17.*

Dr. Gundersen.

C11. Spring Flowers and Ferns of the New York Region.—This is a field course of eight exercises given in the parks and woodlands of Greater New York. The common native and naturalized wild flowers are visited as they come into flower, and their characteristics and distinguishing features studied. *Class limited to 30, taken in the order of application. Fee, $4.00. Saturday afternoons; April 23 to June 18 (omitting May 28).*

Dr. Gundersen.

C9. Trees and Shrubs of Greater New York.—Ten outdoor lessons at the Garden and elsewhere in Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, and the features pointed out by which they may be most easily recognized; also their habits, rate of growth, economic value and use, methods of planting and propagation; importance in forestry, horticulture, and landscape art. *Limited to 50 members enrolled in the order of application. Fee, $5.00. Saturdays,* 2 : 30 p.m., *April 9 to June 18 (omitting May 28).* Dr. Graves.

D. Consultation and Independent Investigation

1. *Consultation*

Consultation and advice, and the facilities of the laboratories, library, and herbarium are freely at the service of members of the Botanic Garden and others with special problems relating to plants or plant products, especially in the following subjects:

1. **Plant diseases** (phytopathology) and classification of fungi (mycology). Dr. Reed.

2. **Plant breeding** and allied subjects (genetics and experimental evolution). Dr. White.

3. **Plant geography** (phytogeography) **and ecology.**
Mr. Taylor.

4. **Classification and identification of flowering plants** (systematic botany). Dr. Gundersen.

5. **The growing of cultivated plants** and their arrangement; also their adaptation to soils, climate, and other factors (horticulture and gardening). Mr. Free.

2. *Investigation* *

For the following research courses, open to those properly qualified for independent investigation, there is a charge covering all expenses, including laboratory fee, of *$30 for each full course* of 100 credit hours, and *$20 for each half course* of 50 credit hours.

E6. Research in Mycology and Plant Pathology.—Independent investigation of problems relating to fungi and fungous diseases of plants. Dr. Reed.

E7. Research in Plant Genetics.—Independent investigation of problems of variation and heredity, including that phase of cytology having a direct bearing on the subject matter of genetics.
Dr. White.

E8. Research in Forest Pathology.—Independent investigation of the diseases of woody plants. Dr. Graves.

E9. Research in Systematic Botany of the Flowering Plants.
Dr. Gundersen.

IV. OTHER EDUCATIONAL FEATURES

Plantations

The plantations comprise several sections, as follows:

1. General Systematic Section (trees, shrubs, and herbaceous plants not native within 100 miles of Brooklyn).

* Courses of graduate rank offered by the Botanic Garden, when approved by the Faculty of the Graduate School of New York University, are listed as courses in the Graduate School, and are given the same credit as other graduate courses. Properly qualified students who take these courses may present them in satisfaction of the requirements for advanced degrees given by the University. Graduate credit has also been allowed elsewhere for such advanced work done at the Garden.

2. The Local Flora (native wild flower garden).
3. Ecological Garden.
4. Rock Garden.
5. Children's Garden.
6. Japanese Garden, etc.

As noted under *Docentry,* arrangements may be made for viewing the plantations under guidance. They are open free to the public daily from 8 a.m. until dark; on Sundays and holidays from 10 a.m. until dark.

Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of fiber hats), fig, grape vines from north and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, black pepper, cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

The Conservatories are open April 1 to October 31, 10 a.m.–4:30 p.m. (Sundays, 2–4:30); November 1 to March 31, 10 a.m.–4 p.m. (Sundays, 2–4).

Herbarium

The Garden herbarium consists at present of over 186,500 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algae, and myxomycetes. This collection may be consulted from 9 a.m. until 5 p.m. by those interested, and specimens submitted will be gladly identified.

Library

The rapidly growing library of the Garden comprises at present over 10,800 volumes and over 7,750 pamphlets. This is not a cir-

culating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). Over 800 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe, the bulletins, monographs, reports and other publications of various departments of the United States Government, as well as those of foreign governments; of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens and other scientific institutions of the world, as well as the files of independent journals devoted to the various phases of plant life. The library is especially rich in publications of foreign countries.

Laboratory Building

The Laboratory Building contains (besides offices of administration and the Library and Herbarium mentioned above) four laboratory rooms, a culture room, two classrooms with stereopticon and other equipment for instruction, a room for the installation of temporary exhibits, six private research rooms, and an auditorium seating about 570 and equipped with motion picture machine, stereopticon and lecture table supplied with water, gas, and electric current for experimental lectures.

Instructional Greenhouses

A range of three greenhouses, each about 20 x 30 feet, is provided for the practical instruction of children and adults in plant propagation and other subjects.

Children's Room

A gift of $1,500 in 1921 from the late Mrs. George D. Pratt, supplemented in 1923 by a further gift of $500 from Mr. George D. Pratt, has made it possible to provide a beautifully decorated room for the use of the Boys' and Girls' Club. Any boy or girl who is enrolled, or has been enrolled, in any of the children's classes at the Garden is eligible for membership in this club, which now numbers about 1,000 active members. The room contains

shelves for a nature-study library, of which a nucleus has already been secured, and is equipped with stereoscopic views, photographs, and preserved and living specimens of plant life, for the instruction and entertainment of boys and girls. The room is open free to all children. Contributions of specimens and of books on nature study and closely related subjects will be most welcome.

Children's Garden Building

This is located in the northern part of the Children's Garden plot and contains a conference room, and rooms for the storage of garden tools and implements. The children's conference room has been refitted this year with furniture appropriate to its uses. The furniture was a gift from Mrs. James H. Post. Various collections of plants, seeds, and insects of economic importance in the Garden are accessible here for consultation by the children. North of the Children's Building is a plot planted to ornamental shrubs and herbaceous perennials for the instruction of the children.

Children's Gardens

A plot of about three quarters of an acre in the southeast part of the Botanic Garden has been set aside for the theoretical and practical instruction of children in gardening. The larger part of this area is laid out in garden plots which will accommodate about 150 children. In 1925 there was added to the southern part of this plot a Shakespeare Garden, the gift of Mr. Henry S. Folger.

INTERNATIONAL CONFERENCE ON FLOWER AND FRUIT STERILITY

The annual financial losses in flower and fruit crops due to various types of sterility is so great that the problem has become one of the first importance, from the commercial as well as the scientific point of view. In recognition of this fact, an International Conference on Flower and Fruit Sterility was held in Greater New York on August 12–14, 1926, under the auspices and with the financial support of the Horticultural Society of New York. The organization of the Conference was in charge of an

Executive Committee consisting of Dr. N. L. Britton, Chairman; Mr. Frederick R. Newbold, Treasurer; and Dr. A. B. Stout, Secretary; and a Local Advisory Committee consisting of Prof. R. A. Harper, and Prof. H. M. Richards of Columbia University, Dr. C. S. Gager, Director of the Brooklyn Botanic Garden, Dr. William Crocker, Director of the Boyce Thompson Institute for Plant Research, and Mr. Leonard Barron, Editor of *Garden and Home Builder*. About 38 institutions and organizations, distributed in twelve foreign countries, were represented on the programs.

The Entertainment Committee for the Conference consisted of Mr. John Scheepers, Chairman, Mrs. Harold I. Pratt, Mrs. Samuel Sloan, Mr. T. A. Havemeyer, and Mr. W. R. Coe. The headquarters were at the Roosevelt Hotel.

At the first session, Thursday forenoon, August 12, the Opening Address was by Dr. Britton, Chairman of the Executive Committee, followed by an Address of Welcome, prepared by Mr. Havemeyer, President of the Horticultural Society of New York, and read by Mr. Newbold in Mr. Havemeyer's absence. Eleven papers were read at this session, after which the members were taken in motor buses to the New York Botanical Garden where luncheon was served by the Garden.

The Thursday afternoon session was held in the Lecture Hall of the New York Botanical Garden. After the presentation of ten papers, there was an inspection of the Botanic Garden under special guidance.

The Friday meetings were under the auspices of the Boyce Thompson Institute at Yonkers. The scientific sessions were held in the music room of the Hudson River Country Club adjoining the Institute. Eleven papers were presented at the morning session and ten papers in the afternoon. Luncheon was served by the Institute, and the laboratories and equipment were inspected at the close of the afternoon program.

The Saturday meetings were held at the Brooklyn Botanic Garden, with eleven papers in the morning and fifteen in the afternoon (5 by title). Luncheon was served by the Garden in the main floor corridors. Inspection of the Botanic Garden buildings, grounds, and collections followed the afternoon program.

The Executive Committee has announced that the proceedings will be promptly published by the Horticultural Society.

Among those in attendance at the Brooklyn sessions were the following: Mr. and Mrs. H. G. Perry, Acadia University, Nova Scotia; Howard S. Reed, Citrus Experiment Station, Riverdale, Calif.; Miss I. Preston, Central Experimental Farm, Ottawa, Canada; Prof. Dr. V. Vouk, Jugoslavia; M. J. Dorsey, University of Illinois, Urbana, Ill.; A. C. Beal, Cornell University; Hilory S. Jurica, St. Procopius College, Ill.; Mrs. Jean S. Kerr, New York City; John T. Bucholz, University of Texas; C. E. Moore, Chico, Calif.; H. E. Hansen, South Dakota State College; Isidoro R. Callado, Philippine College of Agriculture; M. B. Waite, U. S. Department of Agriculture; A. E. Stene, R. I. Experiment Station; B. E. Gilbert, R. I. Experiment Station; C. F. Clark, U. S. Department of Agriculture; Muriel Lascoe, Acadia University, Nova Scotia; C. E. Myers, Pennsylvania State College; Mr. and Mrs. Cecil Yampolsky, Grandwood, Nova Scotia; F. E. Lloyd, McGill University, Montreal, Canada; A. P. Saunders, Clinton, N. Y.; Prof. Robert Chodat, Geneva, Switzerland; H. F. Bergman, Honolulu; Conway Zuher, Bussey Institute, Boston, Mass.; Geo. L. Slate, Agricultural Experiment Station, Geneva, New York; J. H. Nicolas, West Grove, Pennsylvania; Kathleen B. Blackburn, England; A. E. Murneck, University of Missouri; Grace Sturtevant and R. S. Sturtevant, Wellesley Farms, Mass.; Violet F. Edlmann, Wellesley Hills, Mass.; Ernst Reed, Syracuse, N. Y.; C. E. Allen, University of Wisconsin; M. B. Crane, John Innes Horticultural Institute, London; Rudolf Florin, Swedish Museum of Natural History, Stockholm; Elizabeth Peterson, New York; R. H. Wetmore, Cambridge, Mass.; Frederic R. Newbold, New York Horticultural Society; T. Susa, Hokkaido Imperial University, Sapporo, Japan; Paul B. Sears, University of Nebraska; Dr. and Mrs. Nicolas A. Maximow, Institute of Applied Botany, Leningrad; Dr. and Mrs. W. G. Dobson, Poughkeepsie, N. Y.; Burt L. Hartwell, R. I. Agricultural Experiment Station; Freeman S. Howlett, Ohio Experiment Station; M. N. Wood, U. S. Department of Agriculture; L. R. Detjen, University of Delaware; E. E. Clayton, N. Y. Agricultural Experiment Station, Geneva, N. Y.; M. Hollrung, Halle University, Germany; E. H. Overholser, University of California; Paul Work,

Cornell University; M. J. Sirks, Wageningen, Holland; Anicoara Stan, Clij, Roumania; Dr. Alexandre Borza, Botanical Garden, Cluj, Roumania; A. M. Banta, Carnegie Institution, Cold Spring Harbor, L. I.; C. H. Connors, N. J. Experiment Station; E. M. East, Boston; D. F. Jones, P. C. Mangelsdorf and H. R. Murray, Connecticut Agricultural Experiment Station; J. R. Johnston, Boston; Clement G. Bowers, Binghamton, N. Y.; Priscilla B. Presbrey, Wellesley College; Esther Mitchell, Vassar College; Lydia Bourne Walsh, Wellesley College; Geo. M. Darrow, U. S. Department of Agriculture; M. Thompson, Ridgefield, N. J.; Wm. Nowell, Department of Agriculture, Trinidad, B. W. I.; B. Němec, Charles University, Prague; Clyde Fisher, New York City; Prof. K. Domin, Charles University, Prague; Prof. Dr. Nils E. Svedelius, Upsala University, Sweden; Georg Tischler, Kiel University, Germany; Harold W. Browning, R. I. State College; F. J. Crider, Boyce Thompson Southwestern Arboretum, Superior, Arizona; Paul Work, Cornell University; Prof. F. Kotowski, College of Agriculture, Warsaw, Poland; Dr. Adrian J. Pieters and Dr. Elmer W. Brandes, U. S. Department of Agriculture; Dr. A. F. Blakeslee, Carnegie Institution Station for Experimental Evolution, Cold Spring Harbor, L. I.; Prof. R. W. Hodgson, University of California; Prof. George H. Shull, Princeton University; F. Brieger, Bussey Institution, Harvard University; Dr. N. L. Britton and Dr. A. B. Stout, N. Y. Botanical Garden; Prof. Ernst Lehmann, University of Tübingen, Germany; Leonard Barron, Garden City; Prof. Dr. Richard von Wettstein, University of Vienna.

INTERNATIONAL CONGRESS OF PLANT SCIENCES

The first International Botanical Congress was held at Paris in 1900, the second at Vienna in 1905, and the third at Brussels in 1910. The fourth, which was to have been held in England in 1915, was not held on account of the World War. It did not seem opportune to attempt another meeting at the regular five-year interval in 1920. After conferring with British botanists and officers of the Congress that was to have been held in England in 1915, an invitation was issued by an Organizing Com-

mittee of American Botanists to all investigators and teachers in plant sciences, representing all aspects of botany, plant chemistry, plant pathology and bacteriology, agronomy, horticulture, and forestry to attend an International Congress of Plant Sciences at Ithaca, New York, August 16–23, 1926. The holding of the conference and the appointing of the Organizing Committee was approved at representative meetings of American botanists (Botanical Society of America, American Phytopathological Society, Ecological Society of America), held in Cincinnati in December, 1923. The Ithaca Congress was, in effect (but not officially), the Fourth International Botanical Congress, but no legislation was attempted touching rules of nomenclature nor any other botanical matters on account of the unofficial nature of the meeting. The work of the Congress was concerned primarily with problems of fundamental research and teaching.

The Congress was organized in the following thirteen sections, with the chairmen chosen mainly from among those attending from overseas, and the secretaries, from American botanists. The numbers indicate the number of papers presented in the given section, not including round table discussions and field trips. Agronomy (14); Bacteriology (7); Cytology (15); Morphology, Histology and Paleobotany (16); Ecology (19); Forestry (12); Genetics (15); Horticulture (14); Physiology (17); Pathology (25); Pharmacognosy and Pharmaceutical Botany (20); Taxonomy (25); Mycology (30). The general officers of the Congress were as follows:

President and Presiding Chairman

Liberty Hyde Bailey, Ithaca, New York.

Honorary Chairmen

Martinus Willem Beijerinck, K. Akademie van Wetenschappen, Amsterdam, Nederland.
John Isaac Briquet, Jardin Botanique Genève, Genève, Suisse.
Aimo Kaárlo Cajander, Helsingin Yliopisto, Helsinki, Suomi.
Charles Flahault, Universite de Montpellier, Montpellier, France.
Karl Goebel, Botanischer Garten und Pflanzenphysiologisches Institut, München, Deutschland.
Wilhelm Ludvig Johannsen, Kjøbenhavns Universitet, Kjøbenhavn, Denmark.

Pacheco Leao, Jardim Botanico, Rio de Janeiro, Brazil.
Daniel McAlpine, formerly Plant Pathologist, Victoria; Croydon, Victoria, Australia.
Kingo Miyabe, Hokkaido Imperial University, Sapporo, Japan.
Hermann Müller-Thurgau, Versuchsanstalt für Obst-, Wein-, und Gartenbau, Wädenswil, Schweiz.
S. G. Nawaschin, Timiriasev Federal Institute of Scientific Research, Moscou, U. S. S. R.
David Prain, formerly Director, Royal Botanic Gardens, Kew; Well Farm, Warlingham, England.
Arrigi Serpieri, Reale Istituto Superiore Forestale Nazionale, Firenze, Italia.
Richard Wettstein, Botanischer Garten und Institut, Wien, Oesterreich.
Emile de Wildeman, Jardin Botanique de l'Etat, Bruxelles, Belgique.

Vice-Chairman

John Merle Coulter, Boyce Thompson Institute for Plant Research, Yonkers, New York.

General Secretary

Benjamin Minge Duggar, National Research Council, Washington, D. C.

Treasurer

George Thomas Moore, Missouri Botanical Garden, St. Louis, Missouri.

About 900 delegates were present from about twenty-five foreign countries, including all the larger nations except France, and from many of the smaller countries, and with rare exceptions, the papers (about 230 in all) were presented in the English language.

The Association of Official Seed Analysts of South America held its nineteenth annual meeting in affiliation with the Congress, and invitations to this meeting were extended to the chief analysts or directors of the Official Testing Stations in Holland, Germany, Denmark, and Great Britain. In the ten invitation papers the following topics were represented: The botany of seed testing; Research work in seed analysis; Germination testing, including Physiological problems, Legislation, and Seed control. Cornell

University acted as host, and nothing was left undone to insure the comfort and pleasure of the delegates, and the success of the meetings, conferences, and field trips. The Brooklyn Botanic Garden was one of thirty-six patrons of the Congress; these included 16 scientific and educational organizations and institutions, 5 commercial concerns, and 15 individual contributors.

EARLY HISTORY OF COMMERCIAL NURSERIES IN NEW YORK STATE

After reading the article on André Parmentier in the Brooklyn Botanic Garden *Record* for January, 1926, Professor G. N. Lauman, of the College of Agriculture, Cornell University, sent the undersigned a letter, reading in part as follows: "It was the reading of your remarks anent the André Parmentier celebration that led me to look up the earlier history of commercial nurseries in New York. Having had access to some data in the Newburgh Public Library, I find that the father of the Downings (A. J. and C.) had sold his carriage business in 1811 and 'had been preparing for several years previous for a change in his business and had been setting out and cultivating a large nursery of fruit trees, . . .'. (James W. Fowler in the *Sunday Telegram,* Newburgh, New York, March 25, 1894.) Some of this data is also to be found in Samuel W. Eager, *An outline history of Orange County,* 1846–1847, pp. 175–177. Eager also mentions '. . . He (Samuel Downing the father above mentioned) was the first in the business in this vicinity. We are aware that Mr. Noah Townsend near Bethlehem in Cornwall, advertised nursery trees for sale in 1805 . . .' pp. 175–177. I realize the difficulty of deciding where the selling of a few trees leaves off and the commercial nursery begins but the Downing nursery was of the latter kind very early."

From this information it would appear that the second commercial nursery in New York was not that of Thomas Hogg in New York City (1822), but either Townsend's (1805) or Downing's (1811), depending upon the circumstances, of which we have only meagre information.

C. Stuart Gager

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

The Botanic Garden is open free to the public daily from 8 a.m. until dark; on Sundays and Holidays open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, and Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street and Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

PUBLICATIONS

OF THE

BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

MEMOIRS. Established, July, 1918. Published irregularly.

Volume I, *Dedication Papers:* comprising scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. Price $1.00, plus postage.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

38. Physiologic races of oat smuts. 10 pages, 3 plates. 1924.

39. Relative susceptibility of selections from a Fulghum-Swedish select cross to the smuts of oats. 17 pages, 4 plates. 1925.

40. Physiological specialization of Ustilago hordei. 21 pages, 1 figure. 1924.

41. Factors influencing the infection of wheat by Tilletia Tritici and Tilletia laevis. 24 pages, 4 plates. 1924.

42. Variation among the sporelings of a fertile sport of the Boston fern. 27 pages, 15 figures. 1924.

43. Inheritance studies in Pisum. V. The inheritance of scimitar pod. 14 pages, 10 figures. 1925.

44. Modes of infection of sorghums by loose kernel smut. 17 pages, 3 plates. 1925.

45. The inheritance of resistance of oat hybrids to loose smut. 19 pages. 1925.

46. Geographical distribution and the cold-resisting character of certain herbaceous perennial and woody plant groups. 10 pages. 1926.

47. The cause of the persistent development of basal shoots from blighted chestnut trees. 7 pages, 1 figure. 1926.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication.

SEED LIST. Established, December, 1914. Since 1925 issued each year in the January number of the RECORD.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $6.00 a year.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year.

GENETICS. Established, January, 1916. Bi-monthly. Subscription, $6.00 a year.